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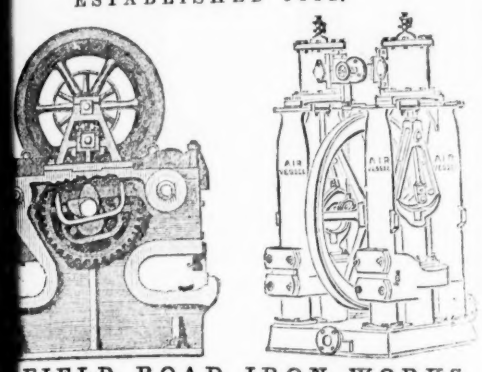

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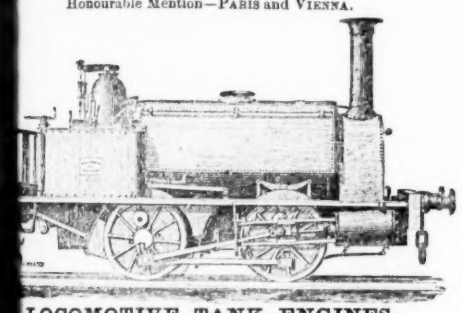

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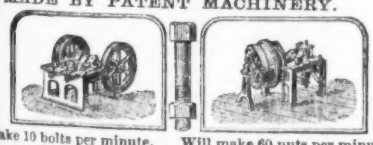

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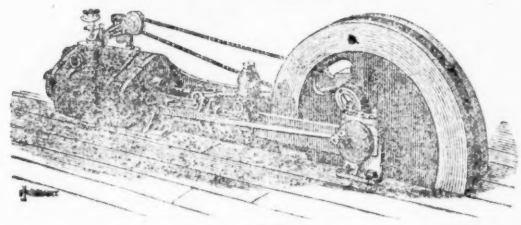

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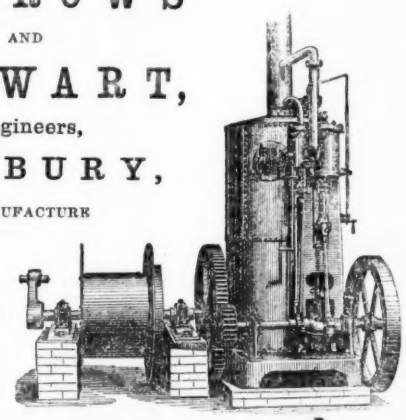

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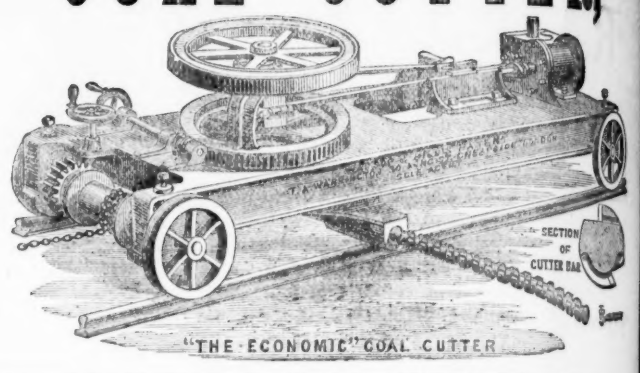

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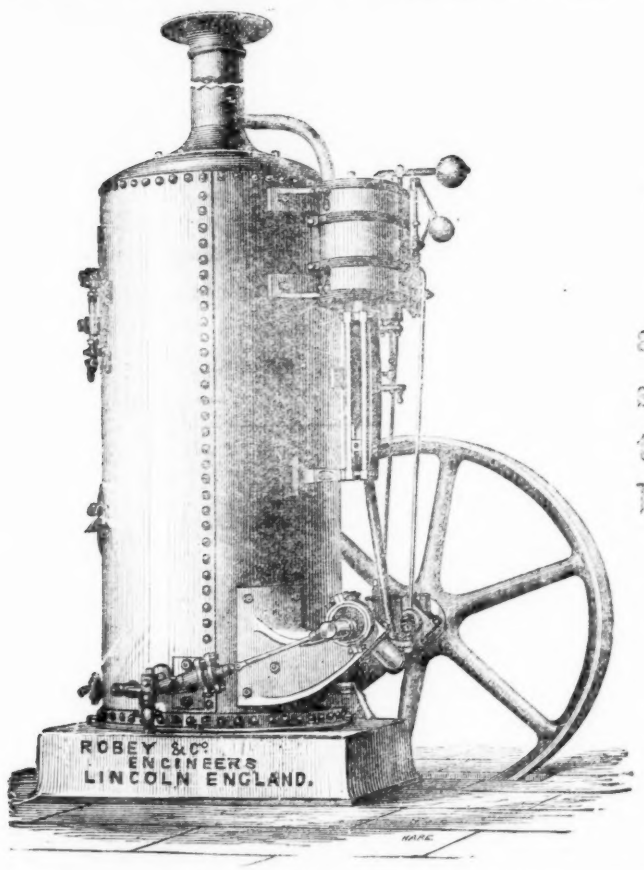

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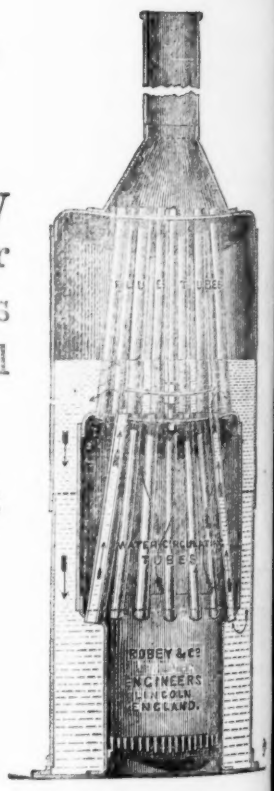

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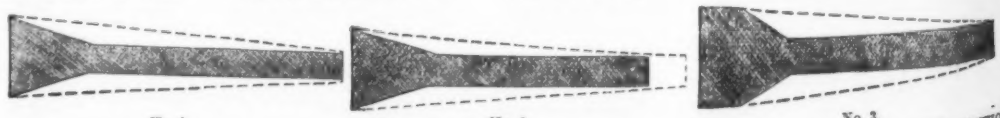

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nnual general meeting of members was continued on Wed- March 30.

Mr. W. MENELAUS (Dowlais) in the chair.

President opened the business of the day by calling on the y to read the paper on—

THE USES OF FERRO-MANGANESE.

By M. F. GAUTIER, of Paris.

e of specular pig iron, or spiegeleisen, as it is termed in Germany, has eat success in the Bessemer process. For some time after spiegeleisen was ployed its addition was merely regarded as a re-carbonising agent, which ered necessary on account of the protracted refining—the required hardness ined by the admixture of a pure and highly carburetted pig-iron, without to consideration the part which manganese might play in the operation. ct of this paper is to consider the principal uses to which this alloy of iron, se, and carbon—ferro-manganese by name—is applied.

FACTURE OF SOFT STEEL.—Those manufacturers who are specially anxious e quality of their produce have always used, in the final addition, in the or Siemens-Martin process, 1 per cent. of manganese in the proportion cent. of spiegel to 10 per cent. of manganese. The spiegel contained 5 per carbon, and, therefore, the addition of 1 per cent. of manganese always d the carbon to 0·5 per cent., and it was difficult, if not impossiblr, to pro- er steel. Mr. Henry Bessemer was the first to discover that, in introduc- all quantity of ferro-manganese, sufficient manganese for the reduction obtained, and the quantity of carbon would be considerably lessened also. ot necessary to melt the ferro-manganese, or to deal with the refuse that oned by the smelting of spiegel, the quantity of manganese added might han 1 per cent. if the yield of carbon were diminished, but it is found pre- o have 1 per cent. as the standard. It has been shown that 1 per cent. of se, in the form of 10 per cent. of spiegel, introduced 0·5 per cent. of carbon metal; and 1 per cent. of manganese, in the form of 2 per cent. of ferro- ese at 50 per cent., will require not more than 0·1 per cent. of carbon to be Experiments have shown that the richer the reducing alloy is in manga- less carbon remains in the produce. Ferro-manganese, containing 75 per manganese, is, therefore, the best where the softest cast metal is required. owing is a comparative statemant of the average resistance of steel, manu- from the same quality of pig iron, but in the first instance spiegel was and in the second ferro-manganese:—

	With Spiegel. Tons per square inch.	With Ferro-Manganese. Tons per square inch.
Limit of elasticity	22	16
Breaking strain	38	28
Elongation per cent. measured over 8 in.	8	25

ecrease of the breaking strain, with the increased elongation, is a decided age where hardness of the material is not specially required. The metal, withstands a heavy breakage load with a small final elongation, has a special ity in the shape of resistance to change or form, which is apparent even when orked hot. In irregular pieces this causes tensions, which often induce ges when cooling, and it was to this unstable equilibrium of the molecule in teel that we must attribute for the most part the inapplicability of steel to ing but rails and tyres. It is necessary when steel is to be used for plates, s, machinery, and such like purposes that it should be very soft, and for purposes consumers should not require it to stand a heavy breakage strain. etice the loads are always supposed to fall with greater or less velocity, and mething similar to a shock. From the construction point of view the exact of a material is the product obtained by multiplying the breakage strain by al stretching, and not the breakage strains alone.

best way to adopt in employing ferro-manganese is to bring it to a red heat er to facilitate the chemical reaction, and to avoid the scintillation which is ed when a cold body comes in contact with the liquid steel. This heating ily done in the Siemens-Martin process by means of the furnace used for g the materials of the charge. In the Bessemer process the ferro-manganese e heated by placing it—as the weight is less, the alloy being richer—in an ssel, suspended in front of the mouth of the converter. When the heating pleted the vessel is emptied into the converter, which is overturned at the times. The reaction is perfect, and the running of the metals into the moulds the two completely. Ferro-manganese is there of great advantage, and to y it usefully the manufacturers are doing all they can to lessen the yield of nese in pig-iron. Ferro-manganese, therefore, is more generally being t into use, as it is found to be the means of obtaining soft steel, and the re- n in the price is assisting in increasing its use, seeing that the employment ered more economical and judicious. Another advantage is that it can be d as well to the Bessemer as to the Siemens-Martin process.

OF INFERIOR MATERIALS IN THE MANUFACTURE OF STEEL.—The most im- t properties required in metals produced from iron are fusibility, hot forging ing, and various degrees of toughness. The chief property of the carbon is art fusibility to the iron, but at the same time it lessens and sometimes alto- destroys its rolling or forging qualities. Pig-iron thus derives its quality g fusible and not rolling to the great proportion of carbon it contains. When ield of carbon is decreased the fusibility is also lessened, but the property of ng out is increased. Carbon, therefore, destroys the quality of drawing out. ience has proved that in producing a smelted metal nearly void of carbon similar to the softest qualities which have been spoken of above, it may con- p to 0·5 per cent. of phosphorus, 0·5 per cent. of sulphur, 1 per cent. of silicon, rom 2 to 3 per cent. of manganese, without losing its drawing out properties. low of silicon and iron, without carbon, but with 7½ per cent. silicon, has perfectly forged. The question may be asked whether the carbon acts in op- ion to these different bodies, or is it the carbon only which exercises the un rable effect in the drawing out. Two causes seem to be at work, but it is dif to explain the phenomenon. Whatever it may be, metallurgists have changed opinions considerably on this point, and no doubt the future will decide the ion, and iron will be presented under a new form to the trade. It is like a uctive mine of new alloys suddenly put at the disposal of mankind, which make its influence felt. We have said that in the manufacture of soft steel cent. of manganese, in the form of ferro-manganese of 50 per cent., was suf- t to obtain a suitable quality, and that if richer alloy—say, of 60 to 70 per cent.— anganese be used, the proportion of carbon would be still less. When we have al with phosphorus qualities, and use 1½ per cent. of manganese with rich s of 60 or 75 per cent., there is an excess of manganese, and the metal may re- as much as 1 per cent. of it. The rolling does not seem to be affected; on the rary, it seems to be rather easier, but what is most remarkable is that phos- us steel shows a considerable increase in the power of resistance to shocks. effect of the phosphorus seems to be neutralised by the manganese. I may icularly mention the experiments made at St. Petersburg for converting light rails of English make into steel. These experiments were carried on in the of the Grande Société de Chemins de fer Russes. What conclusion, from a deal point of view, may be drawn from these properties of soft steel contain- from 0·3 to 0·5 of phosphorus? Pure ores are rather scarce, and are likely to me exhausted, and of late years their price has been nearly trebled, owing to excessive demand. This means that for common steel rails, for instance, a er means of manufacture is wanted in addition to an almost unlimited power oduction. In the ore process of using a bath of pure pig iron, mixtures may mployed containing 0·3 to 0·4 per cent. of phosphorus. Most English pig-iron, t that of Cleveland, is thus treated, and this may lead to a considerable re- on in the cost price. On the other hand, the considerable increase in the use of rails consumes a large quantity of old iron rails which have been almost without e. The question of the re-manufacture of old materials into steel is sure in the re to be brought prominently under the notice of the railway companies. This ation can be performed in the Siemens-Martin process at a cost which com- favourably with that of the Bessemer process.

MANUFACTURE OF MANGANESE STEEL.—Of late years attempts have been made ply the term "steel" to certain alloys in which carbon was replaced by sundry le bodies, such as tungsten, chromium, silicon, boron, manganese, &c. Expe- ce has not shown, however, that such a generalisation is warranted. If fusi- , drawing out, and sensitive tempering are taken as the distinctive qualities eel, it may be stated that manganese steel exists also. An instance of this be given in the following analysis:—

Carbon	0·38
Manganese	1·38
Iron	98·24=100·00

steel is a fine-grained body, whitish grey, and very brilliant. Under cold mering it may be slightly drawn, but cracks at the angles; when red-hot it is uctile as iron, and is very soft; when white hot it can easily be forged, and can elded together without artificial means. If it it tempered in water when bright- the surface scales and becomes as hard as quartz, then it becomes brittle, and fracture is more brilliant, almost white, and without the bluish glitter. These If I mistake not, the properties of a real steel, but notwithstanding a small pro- ion of carbon, if it were not for the manganese, would place it in the class of metals, which cannot be obtained by spiegel. This is, therefore, a new body, ch will in the future play a prominent part in metallurgy.

he judicious combination and treatment of the different elements which are at disposal of man will attract more attention in the future, but only little is known this question at present. Amongst the elements which may be most readily used admixture is manganese—it is found most plentifully as a mineral product, and a most active element. We must again refer to this influence of manganese be- e of its utility in the production of steel, and may say that the conclusions ved at have been come to by reasoning of the most veritable certainty. In cer cases where manganese is found in small quantities, and is partly eliminated he successive operations, it may be stated that the perfection of chemical analysis not admit of the detection of the small proportion of manganese contained in excess of iron. Manganese is now found in the best steel, where its presence merly was not even suspected. It may now be affirmed that this "stealing" pensity of certain minerals is now available for all districts where they do not t in a state of nature, under the simple and useful form of ferro-manganese.

Mr. BESSEMER, having been called upon by the President to open discussion, said that in the earlier stages of his process he sought make himself as well acquainted as he possibly could—from such urces of printed matter as were then open to the public—with the tem of manufacturing iron and steel as then practised. Among ose sources of information he found that Mr. Marshall Heath, who as an employee of the East India Company, had been so impressed ith the value of manganese in the manufacture of Wootz steel—e only cast-steel at that period known—that he considered it of the utmost im- rtance to introduce that invention into England. For that purpose he gave up s position with the Government, came over to England, made certain experiments re, and went down to Sheffield, the great seat of their English steel manufacture. e introduced to the manufacturers of Sheffield that material, the nature of which as little understood except by himself—a sort of physic as it was called. It was id in little packages, and he instructed the steel manufacturers of Sheffield to put certain weight of that material, wrapped in a little piece of paper, into the cru- ble during the operation of melting the steel. That material was metallic man- anese, a material so difficult to reduce from its oxides that very few had succeeded revious to that in producing the metal in a metallic state; certainly no one, he lieved, had produced it in large quantities. It was found that very inferior rands of iron, compared with those brands that were generally used in England, uld be made into very excellent steel by the use of manganese. So far it chapened e production, while it did not injure the quality of the material produced. He (Mr. Bessemer) became acquainted with these facts, and he suspected—though he did not know thoroughly in the early stages of his process—that that was a material which would help him also, because he was endeavouring to introduce an inferior brand of iron, and make it into cast-steel. Seeing that he could not introduce oxide of manganese and carbon together usefully into his process, he commenced some experiments in the reduction of the oxide of manganese to the metallic state. In that he found considerable difficulty—indeed, the difficulty chiefly arose from the fact that he powdered the charcoal, and mixed it with the powdered hematite iron and the fine oxide of manganese. Those powders did not allow the minute particles as they were reduced to fuze and run into the mass. He found that by putting in moderate sized lumps—the size of peas, or larger—of hematite ore, and excluding all the dust, and putting in little lumps of charcoal also, that he could gradually reduce in the crucible the oxide of manganese and that of iron to the metallic state. They ran readily through the lumps of charcoal to the bottom, and the ferro-manganese was tolerably easily produced, one disadvantage attending that mode of production being that the oxides were very apt to flux the inside of the crucible and find their way through to the outside if too much heat was used before the entire reduction was produced. Just about that period a patent was taken out by Mr. Mushet for the introduction of manganese into his (Mr. Bessemer's) process precisely the same as that which was used in Sheffield—that was, he mechanically mixed the powdered oxide of manganese with pitch, and then reduced that mixed material to a powder, and it was proposed to be blown in at the bottom of his (Mr. Bessemer's) vessel through the tuyeres. He need not tell them that under those conditions no reduction of the manganese would take place, and such a mode of proceeding was utterly valueless. In the meantime, a further patent was taken out by Mr. Mushet for what he called a triple compound—that was for uniting carbon, iron, and manganese. They had been stopped by that patent for the time; it barred the way for any further experiment, for a time, he was afraid. However, after full deliberation and consultation on the matter, he discovered that a triple compound of iron, carbon, and manganese existed in almost innumerable pig metals, but in various proportions, especially in the metal called spiegeleisen in Prussia, where it amounted to something like 7 or 8 per cent. of manganese. An interval of some time elapsed, and he (Mr. Bessemer) began to see the necessity of manufacturing ferro-manganese on a large scale for his process, for the very reasons pointed out in the paper, which were that it would enable them to make a very mild metal, and the use of spiegeleisen would not do this, owing to the quantity of carbon in the material. He had heard that large quantities of manganese were being used in Glasgow in the chemical works there, at St. Rollox, and with a view to ascertaining whether the proprietors of those works would manufacture spiegeleisen with their waste—spent manganese—he took a journey down to Glasgow, and Mr. Henderson succeeded in producing ferro-manganese.

Mr. HENDERSON described the process of manufacture. At one time he was almost in despair of success, and consulted, or rather he happened to mention his difficulties to, a chemical manufacturer in Glasgow, who was certainly a great genius, and he suggested that he should make the roof of the furnace of bricks, made of carbon. Well, of course, it was absurd, but it immediately occurred to him why should he not make the bottom of those bricks, so he took some hard coke and ground it up very fine, mixed it with a small quantity of tar, just enough to cement the particles of coke together, and put it into the cast-iron moulds. He heated it up to red-heat, and then they made beautiful solid carbon blocks. Those they built in and under a furnace bottom 18 in. thick, and afterwards they had no difficulty whatever. They worked that bottom for three years, and when they took it out it had scarcely worn away an inch. Just when they had arrived at complete success the works in which the furnace had been built unfortunately came to grief, and the patent was bought up from him by the Tharsis Company. They had retained it in their hands ever since, and had done nothing whatever with it in England. He remarked that he suggested to their worthy President, long before they heard of the Danks furnace, that if he would line his furnaces at Dowlais with carbon blocks that very likely they would get over the difficulty of burning and destroying the fettling. He thought that in those revolving furnaces if they were to put a thin lining, perhaps 3 or 4 in. thick, of those carbon blocks next the carbon casing, and place their fettling on top of that, they would never have any chance of their metal near their casing, and he thought the furnaces would keep their shape, and carbon being a such a bad conductor of heat, there would be no difficulty in working the thing in that way. He found that the oxide of iron in coming in contact with the carbon was immediately reduced into a skin of wrought iron, or almost steel, and that it was protected at once.

Mr. HACKNEY said there were several points of great novelty and interest in Mr. Gautier's paper, but there were some which English steel makers might fairly question. Metal without manganese was invariably red short, but it was forgeable with manganese in it. Iron without sulphur might, he thought, be forgeable without manganese, and he knew that iron with less than ·04 of sulphur is forgeable with ·02 of manganese, and steel with up to 8 per cent. of carbon is forgeable at red-heat. Mr. Gautier had stated that steel with much phosphorus cannot be rolled, but he (Mr. Hackney) did not think the forgeability of steel at a red-heat was affected by phosphorus.

Mr. BAKER considered that there was a great opening for ferro-manganese at Sheffield.—Sir JOHN ALLEYNE, Bart., would like to put in one word for the spectroscope, which, he thought, ought to be of use. He thought if the chemists would only take to that one instrument and teach them all how to use it, they would do very great good. Probably, in the Bessemer furnace, which M. Gautier was there alluding to, the process might be too rapid to enable them to get the observation, because there the changes were going on from minute to minute, and as he (Sir John) pointed out some month ago, they could not see the metal itself, it was down in the bottom of the furnace; he only saw the flame and flash coming from it; therefore, to use the spectroscope in that way would be of no use, but if they took a little of the metal from the furnace, pounded it up, and put it into the frame, and looked at it with the spectroscope, he would see what he was doing directly, but in the Bessemer process, probably by the time he had done that and got back, so rapid was it that that would be delusive. But taking the Siemen's furnace where the operation was going on he had abundance of time, and could undoubtedly get a reliable result, supposing the system to be right. Then, with reference to Mr. Henderson's observations, he would like to point out just one thing. He called their attention to the carbon blocks, and he would like Mr. Henderson to explain how he would make the oxide lining stick to the exterior carbon lining, because all of them who had burnt their fingers with the rotators found that that was what was the matter.

Mr. HENDERSON did not know anything of revolvers by practical experience, but would apprehend that this would be much easier to stick an oxide of iron to than the iron shell itself, and that it would not be so liable to contractions and expansions; and he believed the conjunction of the oxide of iron with those carbon blocks would reduce a small quantity of iron next the skin, and would hold it much better than any iron shell would hold it. Then there was a little difficulty occurred to him since about starting the furnace; supposing it was lined with those carbon blocks, before it got up to its red heat there might be a question of bad burning: he thought it would easily be got over by saturating the coke with a sulphate of magnesia, for instance, which, at any rate, could do no possible harm to the iron afterwards, and that would render it incombustible. By steeping the coke in sulphate of manganese, drying it, and then grinding it, they would prevent combustion in the carbon blocks, but he had found all these preparations with carbon blocks, if ground very fine, come to be of the nature of plumbago and graphite, and it was almost impossible to burn them. He had had an instance of that. He broke up one of those bottoms in which they had been smelting cast-iron and steel; he sent it down to a foundry, asked them to put it into the cupola and use it for coke. They sent it all back again, and said it all came down to the tuyeres just as they put it in; and they had to rake it out; it would not burn. He thought there was something in it; it was not a thing he was himself interested in, but he threw out the suggestion.

Mr. SNELUS said he found the tests with ferro-manganese were not such as would be passed by any inspector of rails in England. If engineers would stipulate such tests as were there given, of course they could make rails containing phosphorus to stand, but had no doubt if the test was given in that paper, where the rail broke with 600 lbs. falling 12 to 14 ft., would certainly be such as to condemn every rail that was made in England in any specification that he had seen yet. Their inspectors, when they came to the works, expected the rails to stand a falling test of 1 ton weight falling 20 ft. or more, and he thought it would be necessary to be cautious how that process was introduced. He had no doubt it was of very great value, but he thought the value of thorough manganese was much more applicable to the manufacture of very soft steel of high class than to the manufacture of an inferior steel rail. He thought it would be a very great pity if Mr. Bessemer's valuable invention of steel rails for railways degenerated into a rail that was very little better than a common iron rail, but that they should try to keep up the standard of their steel rails, otherwise they would get such a character for them that they would be condemned. With respect to use of ferro manganese for the very soft steel, he had not himself had the pleasure of using it, but he had made very careful enquiries where they had used it at Crewe. He was told the other day that they were making boiler-plate steel, using 1 per cent. of ferro manganese, putting the ferro-manganese into the ladle, and pouring the blown metal into the ladle: and that metal worked quite as well as copper—indeed, the boilersmith said he could do anything with it, he could double it up, that it would work equally well with copper. They were making fire boxes for locomotives of it. At the same time, while ferro-manganese gave them the power of making an extremely ductile material, they must not forget that their ordinary manufacture of spiegeleisen had improved so vastly that even with spiegeleisen of high quality they could now make very excellent material.

Mr. COWPER mentioned that he had been enabled to determine the percentage of carbon in iron with tolerable accuracy by the use of a set of files of known hardness.

The next paper read was a description of the Ferroux Rock-Drill and Air Compressor, by Mr. H. W. Pendred, C.E., of London, but no discussion followed, the President remarking that it was a paper of no very direct interest to iron and steel makers, although the council had permitted it to be read, because many of the members of the Institute were mining engineers. An abstract of the paper was published in last week's *Mining Journal*.

ON CARBON AND OTHER DEPOSITS FROM THE GASES OF BLAST FURNACES IN CLEVELAND.

By Mr. JOHN PATTINSON, Analytical Chemist, Newcastle-upon-Tyne.

In the October of last year Messrs. Gilkes, Wilson, Pease, and Co., of the Tees Ironworks, Middlesborough, blew out two of their large furnaces. As they had only been in blast since September, 1870—a period of five years—it was expected that the brickwork of the upper part of the furnaces would still be in good condition, and that it would only be necessary to re-line the lower part to about the top of the bosh es; but, on examination, it was found that the lining, almost to the top of both furnaces, was so crumbling and disintegrated that it was necessary to pull the whole out and line afresh with new bricks. My attention was called to the condition of the bricks which had been taken out of the furnaces, and I made some investigations with the view of ascertaining the cause of the disintegration, and, if possible, of suggesting the means of preventing its recurrence in the future. At a glance it could be seen that the crumbling bricks were highly charged with carbonaceous matter, and that it was, in fact, the accumulation of this substance in the pores of the bricks which had burst and disintegrated them. The bricks in which the action was most developed were so soft that they could be readily pierced by a trowel or other pointed tool, and could be easily crumbled to a fine powder between the finger and thumb. The carbonaceous matter stained the fingers like lamp-black. Mr. Chas. Wood, the engineer of the works, very carefully measured and noted from day to day the extent of the carbon impregnation in the brickwork. The original fire-brick work at the bottom of the furnace, and for about 29 ft. above the hearth line, has been very much corroded and removed. Above this the original diameter of the furnace is kept pretty closely, until about 70 ft. above the hearth, where the lining is entirely removed by the mechanical action of the charges of raw materials as they are thrown into the furnace. A little below this point, at the height of about 67 ft., it was found that the diameter of the furnace was actually narrower than the original diameter by about 4 in. This is not owing to the adhesion of any extraneous matter to the brickwork, for the lining bricks were bare and quite plainly seen at this point. If the furnace was really built of the diameter shown by the drawings, then the remarkable fact remains that the bricks have been burst and expanded by the action of the carbon so as to project in the extraordinary manner shown in the drawing.

The furnaces are 85 ft. high, and the diameter at the boshes was originally 27 ft. The capacity of each furnace is 32,000 cubic feet. The lining was made with fire-brick lumps, obtained from two different makers in the Durham and Newcastle districts, one maker's bricks being used up to the height of about 40 ft. in each furnace, and the other maker's bricks above this height. It may be stated here that both kinds of brick appeared to be equally affected by the carbon deposit. A careful examination of many of the bricks showed that they had contained a number of black iron spots, formed from pieces of ironstone or pyrites existing in the clay, and it is on these iron spots that the greatest amount of carbon is found. Little nests of ferruginous carbon, often about the size of horse-beans, were found on the places corresponding to these spots, and the accumulation of carbon in some cases had apparently grown so large as to split the brick, and thus to open it to the more ready passage of gas. Some of the bricks had only carbon deposited in these nests, but where the action was more fully developed, every particle of the brick seemed impregnated with carbon, and the whole changed to a crumbling disintegrated mass. The carbonaceous deposits formed on the iron spots was examined and found to contain—

Carbon	84·9
Ash, chiefly oxide of iron	15·1=100

The question naturally occurs—How is it that this peculiar action on the brick-work does not occur, or has not been observed to occur, in other furnaces? The fire-brick linings of furnaces in Cleveland all contain peroxide of iron, are all more or less porous, and are subject to the same conditions of temperature. In reply to this it may be said that furnaces may often be in this condition without its being observed. It is usually taken for granted when a furnace is blown out that the whole of the lining must come out, and as the duty of removing it is usually entrusted to men who are not interested in observing the condition of the bricks, any portion of the lining which is not of sound brick is thrown upon the rubbish heap without further notice. There is, moreover, evidence to show that this action of the gases on the brickwork *does* often take place. On making enquiries since this investigation was commenced, I find that the brickwork of a flue around the top of a furnace in Lincolnshire, made to convey the waste gases away, was found to be strangely blackened and distorted, necessitating the re-building of the flue. Mr. Thomas, the manager of the blast furnaces at Tudhoe, which have recently been blown out, says that the brickwork of both furnaces for 36 to 40 feet from the top was black and just like coke, and that it had all crumbled away and fallen into the furnaces. Moreover, in all probability this action on the brickwork is the cause in many instances of the bursting of the hoops and iron casings of furnaces, which so often gives trouble to managers.

A consideration, then, of all the circumstances elicited in this investigation would appear to indicate that in selecting bricks for use in the blast furnace, which shall be able to resist as much as possible the disintegrating action of the gases, those coming nearest the following conditions should be chosen:—

1.—They should contain as little oxide of iron as possible.

2.—They should be free from iron spots.

3.—They should be close in the grain or texture, so as to prevent the ready passage of gas through the pores.

Turning now to the other substances which have been absorbed by the bricks, the great increase in the amount of potash attracts attention. In the sample taken 39 ft. from the hearth, there is 11·45 per cent. of potash, or more than four times the amount (2·6 per cent.) contained in the original brick. In the sample taken from 45 ft. above the hearth, the potash is 5·30 per cent., whilst the original brick (No. 2) contains 2·45 per cent. The sample from 67 ft. above the hearth contains just about the same amount as the original brick, showing that at this height no accession of potash has been received. Potash is also conveyed to the bricks through the medium of the gases. Mr. Bell's experiments show that the gases of the lower part of the blast furnace contain very considerable quantities of potash and soda. These are accumulated from the small quantities entering the furnace with the raw materials. The alkaline salts are volatilised by the intense heat near the tuyeres, and are carried upwards with the gases. They are in a great measure condensed by passing through the cooler materials in the higher parts of the furnace, and so carried back to the region of the tuyeres to be again volatilised. After they have accumulated to a certain extent the excess is carried out of the furnace either with the waste gases or with the slag.

It is somewhat remarkable that in the sample of brick taken from 39 ft. above the hearth about 4 per cent. of the potash exists in the form of chloride, and that none of it is in the form of carbonate. Mr. Bell gives the analysis of a substance containing 52·9 per cent. of chloride of ammonium found in the gas tube of a furnace using raw Cleveland stone, and an analysis of "fume" showing 0·57 per cent. of chlorine; but I am not aware that the presence of chloride of potassium has been observed before either in blast furnace gases, or in any of the matters which they have deposited. The brick taken from this part contained several well-defined crystals of this substance, about 1-16th inch cube. Some of the Cleveland ironstones used in these furnaces are known to contain considerable quantities of chloride of magnesium and other chlorides, so that it is likely that the decomposition of these substances by the heat of the furnace, and the subsequent union of the chlorine with the potash in the gases, has given rise to the formation of chloride of potassium, which has afterwards found its way into the brickwork. The soluble iron observed in this sample, I am inclined to think, is simply the result of the action of the chloride of potassium upon the minute particles of metallic iron in the presence of moisture after the sample had been removed from the furnace, just as in the well-known case of a rust joint being formed by mixing iron filings with chloride of ammonium, or chloride of sodium, in which soluble iron is also formed.

The white porcelain like substance covering the brickwork to a great thickness on the parts of the furnace extending from 22 to about 49 ft above the hearth was next examined. In some places this deposit was 9 in. thick. On exposure to the air it was found to be very deliquescent. An analysis shows that the substance had been produced by the action of the alkalies in the gases acting on the brickwork, forming a semi-fused mass, which had been run down the sides of the furnace to its present position. But, if the condition of the furnace be examined, as shown in the drawings, it will be seen that this cannot have been the mode of its formation, for the brickwork has retained its original dimensions, not only behind where this substance is found, but also above this part, excepting for a short distance, about 50 ft. above the hearth, and the amount removed here is quite insufficient to account for the large quantities of the substance which were found. The materials charged into the furnace cannot have been melted in their passage down this part of the furnace and thus helped in the formation of this substance, or otherwise larger quantities of lime and magnesia would have been found in it. There is very little doubt that this substance has been formed by the condensation against the sides of the furnace of the silica, alumina, potash, and other matters which have been vaporised at the tuyeres and carried upwards with the furnace gases. When it is considered to what destructive agencies the brickwork is exposed the wonder is that it lasts so long as it usually does. It is quite likely, however, that the deposition of a coating of substances like those just described serves the important purpose of protecting the brickwork from these destructive agencies by sealing up the bricks so as to prevent the admission of gases. No bricks were found disintegrated by carbon in any part of these furnaces until 37 ft. above the hearth line is reached, below which point the brickwork is covered by this mixture of alkaline and aluminous silicates and carbon.

Another very extraordinary instance of carbon deposition from waste gases has been found at Messrs. Gilkes and Co.'s works. An underground brick flue conveys the gases from the furnaces to the heating stoves. Next to this flue there is a covering of concrete made of slag and lime. The walls of this flue have been on two occasions so distorted and pushed away by a deposition of large masses of carbon in the concrete as to necessitate their being re-built. Many shovelfuls of the ferruginous carbon were found in some places. The deposit soiled the fingers very much, but yet it had a distinctly granular character, and was somewhat coherent, resembling in this respect blocks of table salt. On rubbing it with a knife or spatula bright metallic looking particles could be seen. Nearly the whole mass was attracted by the magnet, those most strongly attracted giving off hydrogen gas on being dissolved in an acid, and showing other indications of metallic iron.

It is evident from the analyses that the iron which had induced the dissociation of the carbonic oxide and the formation of carbon had originally existed as Cleveland pig-iron, for, on calculating the constituents into the condition in which they occur in pig-iron, we have the following results, which approximate very closely to the composition of Cleveland pig-iron.

	Per cent.
Iron	90·73
Manganese	0·47
Silicon	1·87
Phosphorus	1·75
Carbon, and other matters	5·18=100

This opinion is confirmed by finding imbedded in the middle of the carbonaceous lumps several pieces (one of them about ½ in. in diameter and about 1-10th in. thick) of pig metal, having all the characteristics of Cleveland pig iron. The cause of the deposition of carbon, then, in these positions is obvious. The slag of which the concrete was formed had contained, as is often the case, some pieces of scrap metal, which had probably become oxydised on the surface. The gas passing through the flue had leaked at some crevices, and, coming into contact with the partially oxydised pieces of metal, heated to the necessary temperature by the passing gases, dissociation of the carbonic oxide had commenced and gone on until the large accumulations of ferruginous carbon were formed. It is marvellous to consider how this action has succeeded in disintegrating, probably large pieces of metal, gradually lifting the particles farther and farther away from their original position, and distributing them amongst the large masses of accumulated carbon.

In conclusion, I have to acknowledge my great obligation to Mr. Charles Wood, who throughout this enquiry has rendered me most important and intelligent assistance. Without his aid I should have been unable to place before you much of the information I have given in this paper.

Mr. I. LOWTHIAN BELL, M.P., was quite disposed to agree with Mr. Pattinson on the mode of action described, for he found that on exposing samples of ironstone—cubes of a foot, he would say—in the flues of their blast-furnace, the action of the dissociated carbon was so violent that in process of time the lump of ironstone crumbled all down to a very fine powder. It was, therefore, quite intelligible why, if a small portion of iron was imprisoned, as undoubtedly it was, those spots of iron were in that brick. The deposition of carbon there would split them up, in the same way as a portion of lime in the interior of a brick was known to split up the solid substance of the brick itself. Well, it certainly at first sight might appear a little extraordinary that a small speck of iron should ultimately become surrounded by so large a mass of carbon as that described by Mr. Pattinson, but he thought it was not difficult to understand how that might take place. They had a small speck of iron in the interior of the brick. The carbonic oxide when it reached that deposited the carbon, and they had now a nucleus of iron surrounded by a cover of carbon. Then a fresh accession of gas took place, and that action went on; the carbon lying next the iron was displaced, and in that way forced through the pores of the brick. He would thus account for the action described by Mr. Pattinson. Mr. Pattinson asked the question whether in the high furnaces that action might not be more serious than in those of a low construction, on account, of course, of the gases being subject to a much greater degree of pressure. Well, all he could say with regard to that was that they had found their high furnaces were more durable than the low ones used to be. They had a furnace 88 feet in height, which had been in blast for the last ten years, although every now and then

his manager came and told him it was impossible to go on any longer, the furnace had been in blast so long, and that they must blow it out and re-line. It was guided, of course, by his sound practical advice, but the next time he went to the works he found the furnace was "taking up" so much, as they technically called it, and was behaving so well that they kept going on, and, in point of fact, he did not know when the furnace was coming to an end; and as Mr. Pattinson truly observed, it was really extraordinary how long a blast-furnace was able to maintain its working condition in the face of such destructive agencies as those which prevailed in the interior of a blast furnace. If any chemist, or any scientific man, were to go to one of their blast-furnaces, and was not informed as to the materials of which the inside was constructed, and he were to take him round one and another and plunge a fire brick into the slag runner, and show him that in less than a quarter of an hour the whole substance of that brick was melted away, just as sugar would be melted in water. Probably one of the last materials he would suggest as a lining for a furnace would be fire-brick; yet they knew that, notwithstanding the action of an enormous quantity of slag—a hundred tons a day passing through their furnaces—they did last that long time. How was that? He could only account for it in one way. The very thing which had formed the subject of Mr. Pattinson's enquiry he believed to be the protecting agency at work in the blast-furnaces, that this dissociation of carbon (which he believed was not suspected to exist, certainly to the extent it did a few years ago) was, in point of fact, a coating which preserved the furnace itself, and there were a good many collateral reasons that rather strengthened him in that view.

The proceedings on Friday morning commenced by the PRESIDENT announcing that the Council had determined to accept the invitation of their Leeds friends for their autumn meeting, which would commence on Sept. 1, and a unanimous vote of thanks was tendered to the President and Council of the Institution of Civil Engineers for the use of their rooms for the present meeting.

Mr. GAUTIER, replying to the discussion which had taken place on his paper, agreed that Mr. Bessemer had explained in an admirable manner the first introduction of manganese into the steel industry, while Mr. Henderson had shown with impartiality the steps made in advance by his process for manufacturing the first ferro-manganese. A sample made very cheaply had been put on the table. He did not agree with Mr. Henderson that carbon decreased as manganese increased, and with regard to the introduction of spegiel he thought no one had employed it successfully, whereas steel-plates made with ferro-manganese had been successfully employed in the French and English Navy. As to the statement about the steel rails in England being too soft, he thought it was because the wear and tear was too severe. It was a practice of this country, but it was no better for steel consumers than for steel makers. The presence of phosphorus in the metal would make the rails harder for purposes such as the best iron rails were used for. This was a question of price. Now, as trade was bad, there was more good ore in England to make iron of than there were orders for. This subject should not be considered merely with regard to the present but also with regard to the future, and he thought it was well for England to endeavour to manufacture this kind of steel with a view to the future.

In the discussion of Mr. Pattinson's paper on "Carbon and other deposits from the Gases of Blast-Furnaces in Cleveland," Mr. SNELUS concurred with the author's views as to the burning of bricks.

Mr. CRAWSHAY, jun., thought he might be able to make a suggestion of some use. During his remembrance it had always been the custom to fill the furnaces up to the tunnel head with coke, and to keep them working for six weeks or two months with very pure clay-band ironstone. The object was to get a glaze on the brick inside the furnace. If furnaces could be worked in such a way as to get a glaze on the bricks, the disintegration that they had heard of would not have taken place, and it might be possible to glaze bricks before they are put into the furnace.

Mr. C. WOOD thought it undesirable to have the melting point so high up the furnace as would be necessary for that purpose.

Mr. PATTINSON explained that during the time the furnaces were in blast they on three occasions put a slack blast in, and on each occasion there was an increased amount of coke required for making the iron. It first began with 22 cwts. of coke for a ton of metal made, and afterwards the furnaces required something like 24 cwts. On another occasion 25 or 26 cwts. was required, and on another occasion about 27 to 28 cwts. of coke per ton was necessary. He did not mention this fact in his paper, because he could not very well trace the action between the deposition either as to the cause or effect of this increased quantity of coke. Mr. Bell, in his remarks yesterday, mentioned the cause of the protection of the brickwork was a carbon deposited from the dissociated oxide. He scarcely agreed with that. At any rate, judging from the result found in these furnaces, the protecting substance had been the silicates of alumina, potash, and soda. Enormous quantities had been deposited to a thickness of about 2 ft., and he found the principal substances were silicate of alumina, potash, and soda.

ON THE CASSON-DORMOY PUDDLING FURNACES.

By E. FISHER SMITH, Dudley.

Any furnace inexpensive to erect, and which can show a clear saving in cost of working without any fall in the quality of produce, must necessarily commend itself to attention. In the Casson-Dormoy furnace it has been attempted to perfect the main features of the old reverberatory puddling furnace of Cort, and to thereby intensify and concentrate its action, and diminish its working expenses. At the Round Oak Ironworks this system of furnace has been tried between three and four years, and three such furnaces have, during the last five months, been producing 90 tons of iron weekly, consuming about 15 cwts. of screened slack per ton, whereas 30 cwts. per ton is usually consumed by the old method; saving about two-thirds in fettling, and from 1s. to 1s. 6d. per ton in bricks and castings. At the same time, the quality of the iron is found to be superior to that made in the ordinary furnaces. The Casson-Dormoy furnace consists of three chambers. In the first is the grate, the flames from which pass over the bridge, and are reverberated by the dome upon the bed in the second chamber. The bed consists of a cast basin or dish, resting on a number of iron friction balls, laid in a second pan of wrought iron filled with water, the supply of which is kept up from a jet of about the diameter of a quill. This basin easily adjusts itself on the balls for expansion or contraction, and it may also, when required, be turned about to allow of equable wear and tear. Through the puddling door on each side of the bed the two mechanical rabbles are introduced, and worked through a small orifice at the bottom. Both doors are lined with Stourbridge clay, and have the usual hole for slag just below them. The third, or preparatory, chamber forms a kind of second bed or hearth; the pigs are heated here almost to melting point by the waste fire gases on their way to the stack. In working the furnaces, on the fire being got up, the pigs are put into the preparatory chamber, and allowed to remain till they are on the point of fusion. They are thereupon passed over the flue bridge into the basin by means of a bar, and are then completely run down by the reverberated fire gases from the grate. The rabbles, somewhat bent down at the working end, are introduced from the doors, and the puddling commences. Each rabble is either worked by hand through the orifice or attached to the mechanical puddler. This is of the usual character, consisting of a vertical reciprocating lever, which can be connected at will, and driven by a crank and suitable spur gearing, erected on a frame above the dome of the furnace. As soon as the metal becomes pasty and adhesive, the rabbles are withdrawn, and the iron "balled up" and shingled in the usual manner. The charges of about 19 cwts. usually take from an hour and twenty to an hour forty minutes. It will be noticed that iron shields are fixed on each side of the doors between the two buckstaves, and about 1 ft. from the ground floor. It is found that the heat of the upper portion of the furnace induces a constant circulation of cold air between the casings thus formed, and the surfaces of the brick walls protect the puddler when the door is drawn up to pick out the blooms. In spite of the important results of this system—results not attained without the usual amount of experimenting—it is not claimed that all the separate features of the furnace present any strongly marked stamp of originality; the pig or heating chamber has probably been used before, though not, it is believed, worked in the method here adopted now, in connection with a double furnace, and especially not with mechanical rabbling. The peculiar circular bed or basin is, perhaps, the most original while it is also one of the most important characteristics of the furnace. By the absence of inequalities and corners, its shape does away with the difficulties usually attending the working of a mechanical rabble, at the same time effecting a considerable saving in the fettling.

Mr. SCATTERGOOD explained that on the average the heats took 30 minutes per heat. The fettling and getting ready the charge a second time took 15 minutes, or an average of 1 hour 57 minutes per heat (exclusive of the Dandy), so that six heats would be got into a day with the iron to which he had referred. He wished to solicit the attention of the meeting for one moment to the way in which this would affect the market for men. He did not know how they were in the North England, but the gentlemen from Staffordshire who were in the room would confirm when he said that they were very short of underhand and forehand puddlers in Staffordshire. There were a great many puddlers in his district who had taken to all manner of work rather than to puddling; and the question seemed to him to be "the machine or the loss of some part of the productive power." They knew that puddlers, with many honourable exceptions, were not taken from the highest grade. He was speaking then of his own district. In that district they drew, as a rule, the underhand puddlers from the lowest class of workmen. Those men were the only men who would learn the trade. He excepted a great number from those, but he was speaking of a rule with many exceptions. The underhands are men who become forehands, and if unreliable when underhands they are equally unreliable forehands, and probably more so from having more money. Most of the labourers' work is with the puddler, and in consequence he thought it was an advantage to the employers as it was an advantage to the workmen to introduce mechanical puddling, which would give them easier work and more pay for it. He desired to say that this furnace had saved according to his experiment, and he did not think that he was mistaken in any respect, 40 per cent. in coal, 50 per cent. in fettling, and it would save something in wages.

Mr. I. LOWTHIAN BELL concurred with the views expressed as in the process of mechanical puddling leading to the ameliorated condition of puddlers. One great advantage would be that with a higher class of men there would be greater regularity in the process, and consequently greater constancy in quality of the metal produced.

Mr. SMITH, in reply to questions asked, said the price of the slack used was 5s. 6d. per ton. They were making preparations to work the furnace with gas, and found no difficulty in puddling.

The CHAIRMAN said the paper was a most interesting and important one, and moved a vote of thanks to the author, which was agreed to.

OVERCOMING STEEP GRADIENTS ON RAILWAYS.

By Mr. HENRY HANDYSIDE, of Bristol.

The chief object of the new system was to provide a cheap and efficient means whereby the locomotive of ordinary construction might be made available for surmounting steep inclines, and without any alteration or addition to the ordinary permanent way, or alteration in section of rails. On all ordinary locomotive lines the steepest portion becomes "the ruling grade" for the whole line; that is to say, the ruling grades decides the weight of the locomotive, the exact load it can draw on that grade, and the weight of the rails along the whole length of the line on which that locomotive has to run. There is no difficulty in apportioning the steam power of any locomotive to the amount of its adhesion, and as this adhesion is solely dependent on the amount of weight which can be put upon the driving wheels of the engine, it follows that the load any engine can take up an incline must be in an exact ratio to the weight on the driving wheels and the angle of the incline. It has been ascertained, by actual experiment, that the limit of adhesion between an iron tyre and iron rail, is an incline of 1 in 6; or, in other words, any locomotive, with sufficient cylinder power, and all wheels motors, will ascend an incline of 1 in 6. Any very close approach to this limit would be of little commercial value, and the nearest which has been successfully employed is an incline of 1 in 10, which has worked for three years on the Baltimore and Ohio Railway, the engine taking up a load as heavy as itself. I use any ordinary locomotive, applying thereto a winding-engine and steel wire-rope, or chain, and peculiarly constructed gripping struts, which also perform the duty of a most powerful brake when descending. The engine having hauled its train to the foot of incline, of (say) 1 in 12, disconnects itself, but leaving the end of the wire-rope fast to the train, it proceeds up the incline for any desired distance, but within the limits of the length of the rope. The struts having been released by the engine driver immediately come into play, firmly grasping the heads of the rails, and thus the engine becomes at once a stationary winding engine. By the application of steam to the winding cylinders the train is drawn up close to the engine. If the incline is of too great a length to be surmounted in one lift, a similar pair of gripping struts are fitted to the last wagon or guard's van of the train, and as they act quite automatically the train is firmly held in its place whenever the winding ceases. This automatic action of the struts, when fully understood, will recommend itself for adoption in all cases where retrograde motion is to be feared on steep inclines; and even on those in this country on some of main lines ranging from 1 in 40 to 1 in 60, and on which such disastrous results have followed from the breaking of couplings or draw bars.

No discussion followed the reading of this paper, the PRESIDENT remarking that it more directly interested engineers than iron and steel manufacturers.

ON IMPROVED CASTING ARRANGEMENTS FOR THE SIEMENS-MARTIN PROCESS.

By Mr. M. SCOTT, London.

The great depression in the steel trade, which set in some time ago, has called forth efforts to diminish the cost of production and to improve the processes and apparatus employed, and it is with this view the author designed the arrangements to be described. Ingots such, for example, as those from which rails are rolled have ordinarily been cast by filling a ladle with steel from the furnace, moving that ladle over each mould, and so filling them in succession, or, when the ingots were to be run from below, by moving the ladle over the git through which the moulds were charged. Occasionally, as by the ingenious arrangement planned by Mr. Siemens, the moulds have been set upon a revolving table, which is moved round so as to bring one mould after another under the end of a spout, communicating with the furnace, until the whole are filled. There is an advantage in employing ladles—that the metal is more thoroughly mixed than if run direct from the furnace, but, on the hand, there are numerous disadvantages. Amongst the most prominent are the following:—The cooling of the metal, the production of skulls, and, as sometimes happens when the ladle stopper does not work properly, of a cold set; the slowness of the operation, which, by leaving metal in the furnace after it is ready to be poured, also leads to a loss of manganese; the complication of apparatus, and having machinery to be moved whilst casting; the risk of a hitch or spill of molten metal during the operations, aggravated by the difficulty of preserving the railway on the edge of the pit on which the ladle carriage runs; the cost especially of re-lining the ladles, the space occupied, the imperfect arrangements for removal of the slag, and the heat to which the men are exposed. In some plans which have been proposed there is also the inconvenience of having casting apparatus close to the furnace, not only during the time of working, but when repairs have to be executed.

The arrangements consist in placing a series of moulds around a central "git" or vertical channel for the molten metal. The git communicates with the moulds at their bases by runner pipes, and the steel is cast on the ascensional principle. The moulds and git are carried on a base plate mounted upon wheels, which run on rails in the casting pit. The size of the ingot can be altered by varying the depth of the fire-brick lump, which forms the bottom of the mould. This arrangement abolishes the use of ladles, and otherwise facilitates the process of casting steel. By this arrangement, when the upper pieces are removed, the steel filling the git and runners can be lifted up and carried away. The casings surrounding the base of the git and runner pipes are of sheet-iron, bolted to the base plate. When filled with sand all joints are enveloped and secured so as to prevent the escape of metal, even should the pipes be fractured. When casting very tall ingots the sand may be rammed and the covers put on. The central git being formed of refractory material, it would not be cut up by the hot metal, even if a large quantity passed through it, as would certainly be the case if an iron git were used. There is a fire-brick lump proposed for the bottom of the moulds, which, when using moulds closed at the top, would afford the double advantage of regulating the length, and consequently weight of the ingot, and of protecting the lower edges of the mould, which are frequently attacked by the hot metal. This power of regulating the length of the ingots, when using close-topped moulds, is one of some importance, for any weight of ingot beyond what is required becomes scrap, and with a variety of weights required, either this must be submitted to or a large stock of moulds kept. When using split moulds it is intended that the parts should be secured by elastic hoops, but the author does not propose to discuss the peculiarites of moulds on the present occasion. The metal setting in the central git would form an ingot of useful dimensions, and the horizontal runners would be of such size as to be available for many purposes. These runners being cast under considerable head or pressure ought to be sound, and they would be clean castings. The slag box under the tapping hole of the furnace is arranged to as to be lifted by a crane, and placed upon a truck, to which it is attachable by hinged joints at one of its lower corners, and a barrel worked by a winch is provided at the other side of the truck, with chains attached to the angle of the box below the barrel. When the truck has been wheeled to the site for tipping, the chain is wound to the barrel, and the box is thereby canted on its hinged joints until the centre of gravity passes beyond them, whereupon the box tips over and delivers its contents. By again turning the barrel the box is drawn back and lowered into its normal position on the truck. Such is a brief description of the author's plan, which, he believes, will reduce costs, and afford advantages not previously secured. The proposed apparatus requires no alteration in ordinary casting pits, ladles would be aboolished, the debris arising when clearing the tapping port, and any cinder which appeared at first would not go into the spout, whilst provision is made for instantly changing the direction of flow from the furnace, when all the metal is out, and directing the mass of the slag into a suitable receptacle, while the construction and working of the whole is simple and inexpensive. These points are not unimportant, for if the run of metal requires to be stopped, as in the event of changing from the filling of one mould or group of moulds to another, then, although not so large, a ladle is still required to contain the metal flowing continuously from the furnace, whereas in the author's plan there could be no interruption to continuous flow into the moulds. No doubt the dimensions of the ladle could be diminished by reducing the flow from the furnace, but according to the author's ideas, this is the very thing to be avoided, for the more rapidly the furnace is emptied the better.

A brief discussion followed the reading of this paper.

Dr. SIEMENS said the subject was one of considerable practical interest, and the mode indicated would probably produce great advantages in the particular process referred to.

Mr. B. SAMUELSON, M.P., then asked for a hearty vote of thanks to the President (Mr. Menelaus), which was warmly given.

Mr. MENELAUS acknowledged the compliment, and observed that he felt highly gratified at having presided over so very successful a meeting.——The proceedings then terminated.

THE EXPERIMENTAL IRONMAKING BY GOVERNMENT IN INDIA.

The resumed discussion upon this question by the practical men of Staffordshire, at their annual meeting which has just been held, leaves much room to conclude that even yet the Government may be able to utilise the poor coal of the Central Presidency in the smelting of the iron ores which are abundant thereabouts. The Mill and Forge Managers' Association have now arrived at the conclusion that Mr. Walter Ness, who is conducting the experiments in the Worrora coal fields, should have sent out to him a practical furnace manager. In the debate at which this conclusion has been arrived at Mr. Charles Wood, the manager of the Tees Ironworks, Middlesborough, who has had much experience in blast furnace management in India, took part by contributing a communication, in which he gives it as his opinion that it is quite possible to make iron from the Worrora coal. Coal should be used alone, and not as a mixture with charcoal. He would recommend a higher furnace and a stronger and a hotter blast than had been tried as yet. His experience at home had been that in this country there were many furnaces working with coke which contained more ash than the Indian coal developed, and plenty working with ore quite as rich. With such ores an excess of flux was needed, still lime in excess was bad. American furnaces worked these rich ores with 12 lbs. of blast, and sometimes made 80 to 100 tons per day. There were small furnaces in the Middlesborough district working Norwegian titanic ore, which was much harder to work than the rich ores of India. Mr. Wood, however, in this connection makes the important admission that the coke with which the Norwegian ore is being smelted in Middlesborough is good. Nevertheless, even with this coke they could not smelt the ore without a large percentage of alumina in addition to the lime. Mr. Healey, a foremost blast furnace manager of South Staffordshire, for whose presence the debate had been adjourned, pretty much concurred in the views expressed by Mr. Wood. The Government and Mr. Ness should, he thought, feel every confidence that the difficulties which now surrounded them would be surmounted, since they were of a mechanical nature only. This conclusion he had arrived at from a careful study of the communications and the diagrams upon which Mr. Ness sought the views of the Institute. He would recommend a higher—say, a 50 ft.—furnace. Before charging the furnace with ore he would have had rising up from the hearth a solid body of fire. Such a solid body would not be obtained by having the furnace three-fourths full of timber. In a furnace so charged there would be scarcely any fire when the iron was down at the tuyeres. Remembering the poverty of the coal, he would have used a greater proportion of coal than Mr. Ness had used.

When the timber was burnt to an ash—for it would not in the furnace become charcoal—the charges on the top would settle down too near the tuyeres to liquify, and the difficulty would be increased by continuing to blow at 3 lbs. pressure. This blast, unable to permeate the half-fused mass, would keep fighting round the tuyeres and hearth, and occasion the turning of the fire bricks, to which Mr. Ness had drawn attention, for the burning of the timber would not give off sufficient heat to glaze the bricks before they had to bear the full power of the blast. "Had Mr. Ness (spoke Mr Healey) looked round for some poor material that would have made cinder, and put a fair quantity of that in before he commenced to use such rich ore, he would, in my opinion, have been more successful." He had known furnace managers who would use in blowing in a furnace merely the very leanest of ores, containing little over 20 per cent. of iron, choosing rather to make very little iron and a great deal of cinder for a few turns until they had got a way through the furnace than to go in for iron at any price. He remembered a furnace in Staffordshire being blown in something after the way Mr. Ness had described, and the hearth was full of iron for the week, the contents being melted at so slow a temperature that it set in the hearth as it was made. The tuyere sides were in that case worse in a fortnight than they ought to have been in twelve months. Obviously Mr. Ness had many grave difficulties to contend against. Chief amongst them was the unsuitability of his fuel. The decomposition of it was a bad fault, and the quantity of moisture and ash was simply frightful for ironmakers at home to contemplate. Still with hotter and more powerful blast, a higher furnace, and such practical aid in the charging and other routine work as could be rendered by a clever furnace keeper, Mr. Ness would, he had confident hope, be as successful in the smelting of iron as he had been in the developing of the mineral resources of the Worrora district of the Central Presidency. Testimony was borne by Mr. Healey, by the President of the Institute, and by other speakers who followed, to the high scientific ability of Mr. Ness in all that related to coal mining and ironmaking, and it was concluded that if he should get from home the help which in this country every ironworks' manager had at hand, the experiments which the Government had wisely undertaken would be attended with commercial success.

SOUTH STAFFORDSHIRE MILL AND FORGE MANAGERS' ASSOCIATION.

This association has just held its tenth annual meeting. The chair was taken by Mr. Wm. Molineux, President, who was supported by Mr. Wm. Farnworth, the vice-President, by Mr. John Lester, the hon. secretary, by Mr. John Jenks, past president, and about thirty others. The report for the past year showed that the association had now assumed its true position—it had become useful to its members alike as to the science and the practice of their calling. Of this abundant evidence, it was pointed out, was forthcoming in the character of the papers which had been read, and in the discussions which had followed. Satisfactory progress was hereby indicated, and it was suggested that with this motto the institute should continue to prosecute its labours in connection with the iron and steel manufactures of the South Staffordshire and East Worcestershire district. The summer excursion to the Crewe Works was adverted to in the report as in every respect gratifying, and it was suggested that the summer excursion for 1876 should be to Woolwich Arsenal and Gun Factories, the secretary intimating that the necessary permission might be obtained from the Government authorities. Arrangements are to be made for including honorary members on the roll. The printing of the papers read is to be referred to the committee, together with the desirability or otherwise of engaging lecturers upon scientific themes. The members showed an increase upon the year, and there was a favourable balance with the treasurer. The report was adopted. The meeting accepted the suggestion as to the visit to Woolwich, and authorised the committee and secretary to make the preliminary arrangements. Upon the motion of Mr. John Wright, Mr. William Farnworth was elected president, and upon the proposition of the secretary, Mr. Wright was made vice-chairman. Mr. Lester was re-appointed secretary, Mr. Barnett treasurer, and the usual complimentary votes were passed to the retiring officers, much stress being laid upon the great worth of the services which the secretary had rendered.

Mr. John Fletcher and Mr. Noah Stanley, both of Walsall, were elected members.

During the speaking, the CHAIRMAN said that South Staffordshire and East Worcestershire, together with all the other ironmaking districts, were passing through a critical period. He had, however, no fear for their own district, or for England generally, if they all acted upon the principle of every man doing his best. Undoubtedly there were better times coming, but such times were not yet close upon them.

The SECRETARY dwelt upon the importance of the mill and forge managers of South Staffordshire being provided with facilities for increasing their scientific attainments. In other districts these facilities were greater than in South Staffordshire and East Worcestershire. In practical matters the mill and forge managers of that district were inferior to none, and in order that they might take the place for which they were fitted wherever steel and iron were produced, he asked that in this matter of science training fair play should be given to them.

MILL AND FORGE MANAGERS ON THE DIRECT PROCESS.

The Mill and Forge Managers' Association of South Staffordshire and East Worcestershire have just been debating the question of the direct process for the making of iron, even as the Iron and Steel Institute have been discussing the direct process in relation to the Bessemer invention of making steel. Certain of the speakers had assisted at experiments made some years ago. Thirty years back one speaker helped in Lancashire an inventor who had been out in the East. The red ores of Lancashire were charged into a common puddling-furnace, and thence brought out direct. The iron obtained was remarkably "red short." It would shingle, and all went on well till it got to a yellow heat, when the iron began to break. After working it down to a small bar it was exceedingly tough, but was not at all usable by the blacksmith or in the mills, excepting by being interlaid with other qualities of iron. The system was not a commercial success. Before, however, it was given up every effort had been used to remove the red shortness, including the throwing into the furnace of a certain amount of fire-clay, with a view of reducing the richness of the ore, to which the red-shortness was really due.

Another member had himself puddled upon a direct process some 19 years ago. This he did for seven months, at a place not many miles distant from the present Barrow Works. They tried all weights, but the average charge was 4 or 5 cwts. The ore used was the very richest of the district—that known as Lindlemoor—but though it would shingle very well, yet it would not work. The effort to make iron direct having, however, once been entered upon it was not to be abandoned without perseverance, and there was no want of money. Ore was next ground to a very fine consistency, wood sawdust was thrown on to the bottom of the furnace, together with some lean Scotch ore and some flue cinder, and good workable iron was obtained, but at a frightful cost—one which altogether prevented the scheme from being a financial success. To produce a ton of iron for which, as rivet iron, 14*l.* was got no less a sum than 2*l.* had to be expended. Even such a balance sheet as this did not dismay everyone. The process was then taken up by another capitalist, who went into it with much thoroughness, and did not leave off till he had expended between 30,000*l.* and 40,000*l.* So great an outlay was insufficient to secure success. The money was all lost, and the son of that man was now earning his bread in an occupation which required but mean ability, and produced but trifling pay. The speaker was disinclined to believe that the ores of North and South Staffordshire could be utilised by the direct process as he had described accompanied the use of ore so splendid in quality as the Lindlemoor of Lancashire.

Other members of the Institute now gave their experience of what had been done more recently—nay, was still being done—with the direct process upon scientific principles much more likely to prove a success.

What was being accomplished with the Siemens' furnace, at Towcester, in the utilising of the poorer ores of that part of the kingdom was instanced in a hopeful spirit. It appeared that some of the Towcester blooms made, most from the native ore, but some also from the rich ores of India, had found their way into South Staffordshire as an article of commerce for use in the rolling mills. As was to have been expected, the blooms made from the Indian ore were the best, they were very fibrous; but, as in the case of the blooms made from the native ore, the iron when rolled into "muck bar" was remarkable for its red-shortness. The operators had to make "sandwiches" of it in order to utilise it. The Towcester iron mixed in this way in alternate layers with Staffordshire iron could, however, be made into marketable product. With such an amalgam an excellent result had been attained in the sheet mill, and an article produced which was equal to anything that had been turned out in the Midland Counties. On one occasion the experimentor took a Towcester bloom and made it into a billet, from which he rolled a thin-gauged hoop. Although the hoop was not perfect it was yet very tough: not without reading that when hot it presented all the red short evidences of which he had spoken. He had suggested to the smelters at Towcester that they should use greater heat in the earlier stages of the process, and they had done so with good results, for the blooms had recently increased in merit. With an admixture of Indian and (say) North Staffordshire ironstone he believed that by the direct process iron might be got as good as the common marked bars of Staffordshire—iron capable of being worked by any blacksmith. The salvation of the direct process lay, he thought, in an alteration in their present system of rolling iron. They would have to adopt quick speeds and light draughts.

An able member of the association was less sanguine than the last speaker. He was inclined to the opinion that the direct process might do for some of the richest iron ores in the world, but if they took the generality of the English ores he feared that the system would fail. What, for instance, were they going to do with the silica and the magnesia in the South Staffordshire and the Cleveland ores? He believed that even the Blair process in America had been unattended with a satisfactory commercial result, and Blair had tested the process more perhaps than any one else. If he was not mistaken, Dr. Siemens had himself complained that he was unable to get from any English deposits ore of a nature sufficiently refractory to be used with advantage as a furnace lining. Dr. Siemens had had to import the Bauxite ore, which was found in only a small district of France, and was exceedingly costly. So long as this was the case he feared that the process did not promise early paying results.

Another member, on the other hand, entertained no doubt of the ultimate success of the Siemens direct process, either with rich or poor ores. Siemens could certainly at one time sell the blooms to which reference had been made for less money than at the same date had to be given for all-mine pig. If that could be done with poor ore, the complete success of the principle was in his view only a question of time and capital.——The discussion was now over.

ROCK DRILLING MACHINERY. — The invention of Mr. C. A. TERREY, of St. George's-road, Southwark, relates to improvements in rock drilling or boring machines, whereby they are adapted for drilling or boring at any desired angle with greater facility than ordinary rock drilling or boring machines. This improved machine is composed of a bogie, or truck, into which is secured any suitable motive power engine in connection with a crank shaft, on one end of which is a toothed wheel for driving the boring or drilling machinery, and which also carries an eccentric for working a force-pump. Vertical guides or standards are secured on the bogie, and a table carrying a sliding saddle works up through these guides. The boring-bar is supported on the saddle with one of its ends working in a screw nut, and the other through a bevel toothed wheel and frictional wheel, or cone-gearing with a cone on a counter shaft, these cones being thrown in and out of gear by means of a screw shaft parallel with the counter shaft. A vertical shaft conveys motion to a cross shaft, and thereby to the boring bar. The table, with its sliding saddle and boring bar, is raised and lowered by the aid of a vertical screw shaft. More than one table may be placed to move up and down in the vertical guides, and more than one saddle and boring bar be placed upon each table.

STEAM-ENGINES.—The object of the invention of Mr. N. SPARTALI of Liverpool, is more particularly to work high-pressure steam-engines at a very great velocity of piston stroke with great economy of the volume of steam supplied through the valves at each stroke, thereby reducing the consumption of steam and consequently the relative quantity of fuel, and giving time to the fire furnaces to impart to the water and steam in the boilers the necessary degree of high temperature to maintain in a constant manner the corresponding working pressure and the regular and quick generative supply requisite for such rapid strokes and velocity of piston.

Original Correspondence.

OHN BAGNALL AND SONS (LIMITED), AND ITS MANAGEMENT.

—Alderman Sadler, of Birmingham, deserves, and no doubt thanks of the great majority of shareholders in the above for the spirited manner in which he defended their interests nnual meeting held on March 27, and every unbiassed mind ncur in all he said—first, as regards Messrs. Daignan being as solicitors to the company. Was such a thing ever heard e, for the same solicitor to be engaged both for plaintiff and nt? The very idea is against all reason. The position of Naylor is exactly similar. What manufacturer would retain vices of his manager during the time he was engaged in a against him for the recovery of money which he considered been defrauded of? and I think it is quite impossible for any do his duty when he knows that he is retaining office against ressed desire of the shareholders. John Bagnall and Sons e of the oldest and best connections in South Staffordshire, uld, with anything like competent management and reason- laries, during even these bad times yield a dividend. The of managers employed and salaries received is something stounding. For instance, there are no less than three general rs and a mine agent, costing the company about 4000*l.* a-year, nost of managers and sub-managers of lesser note, and this apital of only 300,000*l.* I venture to affirm that one general r with 1000*l.* a-year would be quite ample in a concern like hareholders in John Bagnall and Sons arouse yourselves, and ot your valuable property to be sacrificed on the altars of tence and extravagance. J. R.

n, April 3.

THORNHILL REEF GOLD MINE.

—This mine appears to have met, like other ventures, with a ssive movement. The shares stood a few years since at 4*l.*, last year at 2*l.* How is it to be reconciled? Are the direc- ntlemen of position, the manager one that commands con- and the affairs of the company duly administered with the attention that is necessary where the property is situated? hy are the shareholders so reticent. The property is first- m all accounts, the capital small—20,000*l.*—and under the system of proposed liquidation will be reduced by one-half *l.* Then if the company get the capital now asked for, and e is honestly spent, say even 8000*l.*, allowing 2000*l.* in pay- expenses of liquidation, &c., the mine ought to rank as one st, and pay reasonable dividends to its shareholders. As a der, who paid over 2*l.* each for the shares, I trust the direc- publish through the Journal their honest views, and let the ow as to the *bona fide* character of the enterprise, so that he shareholders refuse may perchance share the fruits of ty so valuable and on the eve of paying dividends, the dead ng done, and so show to dissenting shareholders their mis-

A SHAREHOLDER.

LINARES, FORTUNA, AND ALAMILLOS MINES.

Sir,—"Inquirer," commenting on my letter in reference to these egrets that I did not describe more fully the position and of each concern individually. An examination of the y reports and accounts, which have just been issued, will to comply in some measure with his suggestion, and to nt my previous remarks with a few more interesting facts tion with these properties. Taking Linares first, as being of the three concerns, I find, on reference to the directors' at the profit made during the past half year has amounted and that, after paying a dividend of 10s. per share, and 00*l.* to the reserve fund, there is still the very respectable 100*l.* carried to the credit of the profit and loss account. been a reduction in the mine's cost, and better results lting; and, as a proof of the progressive character of the e has been an increased extraction of ore, which has caused ntion in the reserves. This is a state of things which must gratifying both to the directors and shareholders. But, ry as is the present position of the company, when we look into the future of this concern we find that the pro- spects are brighter still. Attention is drawn in the report to that f the mine in which Peill's shaft is situated. This is a rimary importance. Peill's shaft has opened up a rich ore in the 45, 55, 65, and 75 fathom levels, below which as not yet been touched. The shaft has now reached the vel, and "the lode will in a few months be intersected at 105 fm. levels, and there is reason to believe that the lode ints will be productive." So says the directors' report, is ground for the belief, for there is a rich lode gone down over them. Here, then, is the prospect of a great course of or 30 fms. in height, and of considerable length, shortly to o the reserves. I congratulate the shareholders on their and prospects. With regard to "Inquirer's" perplexity price of the shares, I am sorry to say I cannot assist him ter. I am unable to explain why the shares are at 5*l.* in per share, which he seems to think they ought to be; bly the better the property is known the more it will be d, and I do not think "Inquirer" need despair of seeing before long at the price he thinks they should be. I hope ccasion to make a few comments on the Fortuna and Alamillos Mines.

OBSERVER.

TISH MINING, AND BRITISH UNDERMINING.

the paper inserted last week on this subject a promise to mention the "underminer," and although the term arently paradoxical when applied to anything but mining, sume that your readers will quite understand us when t undermining exists where there is no mining, and for past we have seen the effect of undermining in the in- of foreign loans, the raising of companies to conduct s of a failing mercantile firm, for the manufacture of a d of gas, and obtaining a settlement on the Stock Ex- same, and the floating of banks, where investors' pockets undermined. We have heard of diamond fields being oil wells named where none exist. We have seen many ompanies offered to the public which have been patronised derminer. Therefore, general mining and general under- y be considered as far distant as the Antipodes, and it is e object of this paper to show it, the writer hoping, in icit truth, that some discussion may ensue.

portion of the paper weekly is intended to be short, and altogether not purposeless, an assumption will be made mining company. The whole concern is purchased for reds of pounds at first; on the outlay of the few hundreds ability company is formed, capital (say) 40,000*l.*, in 20,000 each. Prospectuses are issued for the sale of these 2*l.* shares are taken on account of the gentlemen on the extreme reticence, however, of the directors to disclose ds to a search at Serjeant's Inn, and, suppose we should search that out of the 40,000*l.* proposed capital 24,000*l.* aken as promotion money, and beyond that one moiety of 00*l.* dividend, we assume a person having taken an interest ertaking so far feels inclined to sift matters a little fur- aving ascertained that the directors, who are the real pro- ve made provision for themselves of at least 500*l.* a year. ently takes a two or three hundred mile journey, when ay) at most six so-called working men, no tribute, no con- k, but all on daywork at wages of about 5*l.* each monthly, or 30*l.* r month, or 360*l.* a-year. We will presume there is a cap- surely must be properly paid. We will presume there is secretary, who ought to be paid, and probably is. We gain—nay, assert—that such a company as above depicted, moters who might attempt to foist on the public an affair d, are in the truest sense of the word underminers. It has that fiction drawn from life has been the most interesting. Fiction or reality, however, we shall be glad to see the matter well ventilated, and hope to send you a few lines in the ensuing week.

Finsbury Circus, April 6. T. VOSPER.

THE LEAD MINES OF DERBYSHIRE—No. II.

SIR,—The deep adits, locally called soughs, are quite a feature of the Derbyshire mineral field. Most of them were driven between 1750 and 1850, varying in length from one to four miles, and nearly all from the valley of the Derwent, which bounds the district on the east, by far the most productive side of the mineral field. Almost all have been constructed by companies with the view of deriving an income from the mines relieved, but in almost every case little or no profit has been made. A similar adit is now being driven from Flint beneath the Halkin mountain. This is a very interesting trial, and it is to be hoped will be more successful than those in Derbyshire. Among the longest are the Calver Sough, the Hillcar Sough, and the Meerbrook Sough. The first of these enters the Derwent a few miles north of Chatsworth, and relieves the mines near Longstone. The Hillcar Sough is driven from the Derwent about a mile south of Rowsley, is about four miles in length, and relieves the once rich mines near Alport and Youlgreave. The mouth is about 200 yards from the Derwent, at the foot of a precipitous bank of shale, overshadowed by dark fir trees, and has a most sombre aspect. The water issues with great force, about 6 ft. in width and 4 in depth, and the volume discharged both here and at Meerbrook gives a good idea of the obstacles in the way of Derbyshire mining. The first part is driven through shale and grit, and afterwards through limestone. The cost is said to have been 40,000*l.* The Meerbrook Sough enters the Derwent by a fine stone arch, about three miles south of Matlock. The water is tepid—about 65° of Fahrenheit—and quite clear. Some 30 years ago it had a depth of 4 ft. at the entrance (now less), and was a pleasant spot for bathing and swimming, as we can testify from experience. This sough is driven about three miles through grit and limestone beneath the old mining town of Wirksworth, and commercially has proved a failure. The cost, we believe, was nearly as great as that of Hillcar. It would be a fair speculation for a company to take up this sough and drive it a mile or two further towards Hopton and Middleton. The prospects might not, perhaps, be brilliant, but money laid out on objects like this is at any rate better spent than if it were lent to Timbuctoo or Patagonia. We may add that it is a most delightful walk from Matlock to the outfall of this sough, though one little known to visitors. The water foaming over boulders of gritstone, the overhanging trees and shrubs, and the abundance of wild flowers form a scene which is not easily forgotten. J. B.

SUNNYSIDE MINES, WEARDALE.

SIR,—In last week's Journal I see a letter from Mr. G. Henwood, and agree with his recommendation to parties desirous of investing to "go and see for themselves." But many persons who go and see mines come away none the wiser, because they have not sufficient knowledge of mineralogy or geology to form a correct judgment as to the productive character of the lodes. Investors, therefore, should not only go themselves, but they should take with them some person competent to advise on the subject of investment or non-investment. Investors going to a mine will generally find persons there ready to praise the property, and say all that can be said to induce speculation, because these persons either have an interest to sell, or they represent those who have, so that their statements should be received with suspicion. Considering the large amount invested in Cornish and other mining districts, and the schemes that have been practised on investors, also the bad results in so many cases, I sometimes wonder at the continuance of the support given to mining. No doubt the prizes which sometimes turn up supply the inducement to go on to prosper. But what surprises me above every other thing is the folly of investors paying such large premiums as have been charged in many cases—5000*l.*, 10,000*l.*, and ever higher sums having been paid for a mere grant. It is time that this system should be superseded by a return to the old honest plan, when no promotion money was paid for a mine except any reasonable expenses attending the procuration of the license or lease. When I was a boy I never knew such a thing as the charging a large premium for a mere license for entry to work in a speculative mine. If any valuable discoveries are made a value is, of course, attached to the property, but nearly every mine brought before the public is purely speculative, and should not, therefore, be incumbered with a large promotion price.

Mr. Henwood knows a great deal about mines, but he is not infallible. I say nothing against Sunnyside Mines, but I advise intending investors to take Mr. Henwood's suggestion to "go and see;" and, further, I say "take an expert with you" that you may not be deceived by interested parties. J. B.

April 5.

GOLD IN WALES—No. XXV.

DOLGELLEY DISTRICT—TWDDYNGLWADIS SECTION *(continued).*

TWDDYNGLWADIS MINE *(continued).*

I have much pleasure in recording that when Mr. Williamson was under my direction I had great confidence in his intelligence and energy, and for the benefit of future adventurers at Twddynglwadis, whoever they may be, I shall give Mr. Williamson's explanations of plans and sections which he made at my suggestion in 1865, too late for me to avail myself of. I regret very much that it is not convenient to give the diagrams in this communication.

WORKING SECTION—DEEP ADIT.—This adit is driven on the lode to a distance of 1017 ft.; the heading joint has been followed the whole distance. Three cross-cuts have been put in through the hanging wall, and one through the heading: Nos. 1, 2, and 4 have been driven through the elvan course, and each of these levels shows that the elvan carries a lode on each side. Nos. 1 and 2 show a strong mysterly lode on the north side of the elvan. No 4 shows a very small lode, with a flookan on the heading, on the south side of the elvan. The lode seen in Nos. 1 and 2 joins the main Tyddyngwladis lode, between shafts Nos 1 and 2. No. 3 cross-cut is driven through the hanging on a small cross-course where no vein was cut; it shows a system of small parallel faults which accompany the lode; these faults alter the strike of the stratum a little, otherwise they are of no consequence. No. 2 A is a small cross-cut put in near the junction of the veins; it is but 5 ft. in; it cut the same vein that was cut in cross cuts Nos. 1 and 2. There are four winzes and one shaft sunk on the lode. No. 1 winze 20 yards deep; No. 2, 20 yards; No. 3, 20 yards; and No. 4 shaft, 109 ft. deep. At a depth of 100 ft. a level was commenced and driven 2 fms. north-west on the lode. No. 5 winze is 20 yards deep. There are five stopes in back of this adit, marked Nos. 1, 2, 3, 4, and 4A. The dotted portion denotes the occurrence of ore.

Middle Adit: This level is driven 594 ft. on the course of the lode, the heading joint has been followed the whole of the distance. There is a winze sunk 10 fms. below adit, and a level driven north-west which intersects the pass shaft; it is also driven north-west on the lode beyond the pass shaft, but the distance of the drivage is unknown, owing to the level being filled with waste. The pass shaft communicates with the bottom adit, the distance between the two (No. 1 and 2 adits) is 88 yards; it ventilates the whole of the workings in the deep adit, and is also very valuable for the speedy transport of material between the two adits. There are two rises gone up in the back, one of which communicates with No. 3 or the top adit; this rise is known by the name of the Waterfall rise, owing to there being a waterfall machine fixed in it for the ventilation of the end of No. 2 adit. No. 2 rise is gone up to within a few feet of the surface; it is valuable, as affording means for the cheap stoping of the backs of the lode, which are as valuable here as in any other part of the mine. There is but one stope, it is, however, very extensive, and forms in itself a series of stopes, which extend from No. 2 adit to the top of the mountain above No. 3 adit.—Shallow Adit: This adit is driven a short distance on the lode; it intersects the great stope gone up from No. 2 adit; part of this shallow adit is now used as a reservoir to hold the water required for the use of the waterfall machine. There are two tram lines fixed throughout the whole length of Nos. 1 and 2 adits with tram wagons, &c., complete. This comprises the whole of the working on the main lode Tyddyngwladis.

Cwmheisian Isaf: Main Lode, Deep Adit: This adit is driven 589 ft. on the lode, the heading and hanging of which is shown the whole of the distance. There is one rise gone up which reaches the surface on the same plat from whence the No. 2 series of levels are driven; there is a cross cut driven in a line of fault; this cross-cut intersects a vein at a distance of 53 ft. from the original vein. A level is driven on the intersected vein for a distance of 142 ft.; the end of this level is within a few inches of joining the original level, so near is it that a hole has been knocked through, and a communication formed between the two. There is a winze sunk in the 142, and a cross-cut put in 18 ft. through the hanging wall, no vein was intersected, the elvan was cut in the end; there is a very small clay joint dividing the elvan and the interbedded trap-rock.—No. 2 A: There is a level driven, but I have not had a chance to examine it, the mouth of the level being full of rubbish, and the level itself full of water. In No. 2 there are a series of levels driven on a number of veins and branches, and several cross-cuts have been put out. There is a winze gone down in No. 2 level, the depth of which is not known, a cross cut was put out between Nos. 2 and 3 levels. This ends the description of the working section.

Explanation of Plan: This is a ground plan showing the whole of the strata, elvan, lodes, faults, &c., as seen in the deep adits. The black lines are faults, the vermillion-coloured portion is the elvan which accompanies the lode, and the uncoloured portion between the irregular lines is the lode. The cross-cuts are marked in and named. The strata are drawn and expressed by the same colours as the Ordnance Survey.

Explanation of Hill Section: All the faults are shown in the plan, and will be described in the report. The slate-coloured are the Cambrian grits and slates; the great fault shown, dividing the slates from the grits, is but the representative of a series of faults which occur and form the bog, underneath which the lodes and faults all join. No. 1 slate, or cinder bed, is a bed of slate rock possessing little or no cleavage; it is striped with felspathic ash, and contains cinders along the ashy line of bedding. These cinders are nearly pure felspar; they have a nodular appearance, and are evidently analogous to the volcanic cinders ejected from our modern volcanoes; the bed is 109 ft. thick, and is overlaid by the No. 1, or 40 ft., trap. These traps are highly felspathic, and totally different from the ordinary traps of North Wales; they are in appearance a very light-coloured semi crystalline rock, that rings under the hammer, and breaks in long rectangular pieces with smooth faces; it differs from green-stone, which has a conchoidal fracture, and is very difficult to break. The whole of these trap beds differ but little in character and composition. They are usually spotted and blotched by hornblendic matter, which is most likely that mineral in an unerystallised state. No. 2 slate bears nearly the same character as No. 1: it contains more ash lines but less cinders, and possesses little or no cleavage. No. 2 trap nearly resembles No. 1, the hornblendic matter having a more crystallised look about it. No. 3 slate, supposed to be equivalent to the Theca beds of St. David's, differs in character from the two preceding beds: it is less ashy, and contains but occasional cinders: it has much more cleavage, and appears in greater regularity than beds Nos. 1 and 2. No. 3 trap has more the character of No. 1 than No. 2, being much less hornblendic than No. 2. No. 4, or the Paradoxides slates, differ from the three preceding beds in containing no cinders, and but very little ash; in places they are very black and aluminous, nearly approaching the ordinary black shales in character. The whole of the beds are highly cleavable, but much broken by faults and joints. These beds are so named on account of the Trilobite Paradoxides being found in them. No. 4 trap is nearly the same in character as No. 3; it is less crystalline, and has in places a granular appearance. Resting on No. 4 trap is the last of the true cinder beds, and no doubt the top bed of a series which might be named the Tyddyngwladis series; it has somewhat the same character as the slate No. 1, but contains larger cinders.

Next comes the first of the Cwmheisian Isaf series, the felspar grits; these are granular felspar rocks; in appearance they are closely allied to the traps. It is very singular that they always accompany the trap, either as underlying or overlying, or both. Trappean grits would be a good name for them, for they are undoubtedly of ashey origin, the ashes having been partly decomposed, and part of the alumina and potash been carried away. The little aggregates of silica found in the felspar clearly point this out as their origin. Over this felspar grit comes the true trap, the same in character as the No. 3 trap of Tyddyngwladis; above this comes the felspar grits, then a hard dark grey slate, different in character from any that occurs on Tyddyngwladis; it is a hard, dark, arenaceous slate rock, with nothing kindly about it. Above this comes the striped slate; this has a character of coming between the cinder beds of Tyddyngwladis and the arenaceous slates which enclose it. Then follow in succession the dark arenaceous slates, felspar grits, trap, felspar grit, arenaceous slates, striped arenaceous slates, arenaceous slates, felspar grit, then a thick bed of trap, striped arenaceous slates, felspar grit, thin bedded striped arenaceous slate, then a thick bed of true trappean grit; this bed varies much in character; in some places it shows a true sandstone, in others a hard felspar grit. Above this comes the great trap, the basis of the Cwmheisian flag series; it is in places very felspathic. The remaining part of the flag series is carried out of the line of section by a great east and west fault. Above this comes the banded felspar rocks of Hafod Owen; interbedded with these is the only true bed of quartzite found in this neighbourhood. The faults which disturb these rocks may be divided into two great classes—the old faults, or those which have a direction nearly north-east and south west, and north-west and south-east, and the new faults, or those having a direction nearly north and south. The old faults are, no doubt, the dislocations caused by the upheaval of the great continental mountain ranges, and the new faults are dislocations caused by the protrusion of igneous matter in the district. The older faults are thrown up by the newer ones, as seen in the plan. All the mineral veins in this district are formed in the lines of fault, and all the principal veins are found in the older faults. No vein of any importance has yet been found in the north and south faults. When a north and north-west fault cross each other, and a north and south fault crosses the junction, loose ground is the result. If the enclosing rock is felspar gold may be expected, and if there is a good run of soft aluminous slates a good deposit of lead or copper rich in the precious metals may be expected.

Elvans are sometimes found in the lines of fault, never out of them: so far it has been the case that wherever an elvan occurs the lode (if any accompany it) is sure to contain the precious metals, either native or mixed with the sulphurets of the more common metals. There are great doubts as to the igneous origin of many of these elvans: this is important, as it is generally believed that wherever there is an absence of intrusive rock there is also an absence of the precious metals. Such, however, is not the case, as most of the rocks hitherto marked as being intrusive are nothing more than the interbedded traps and sedimentary trappean matter.

TYDDYNGWLADIS MINE.—Report on the Main Lode: The Tyddyngwladis Mines have long been known for the richness of the galena in silver, but before last summer no true silver ore had been found. I then had the good fortune to discover an ore of silver. It is a compound sulphuret of silver, zinc, copper, and lead, and contains from 4 to 9 per cent. of pure silver. I have found it in three different places—in the bottom adit, in the stope of the second adit, and in the lode-stuff lying at the mouth of the top adit. Gold is found by assay in all the different classes of ore. I have found grains of native gold in the silver bottoms after dressing the ore in the second adit for lead. Visible gold in the rock has been found in two different places—one at the back of the smithy in a small lode, and the other in the vein (E. and W.), about 200 yards north of the top adit. The deep adit driven on the base of the hill from the yard of the mine cuts the lode 22 yards in from the mouth. At this place No. 2 fault, marked on plan, crosses the lode, and marks the boundary of the disturbed ground that exists between Nos. 1 and 2 faults. Between Nos. 2 and 3 faults the lode is thin and poor, made up of carbonate of lime, quartz, schist, &c., with a good flookan serpentining from wall to wall. In some places the vein is 1 ft. thick, and filled entirely with clay. In some places, as near to fault No. 3, it is fully 3 ft. thick. Between faults No. 2 and 3 stains of blue and green carbonate of copper are to be seen on the walls: 219 ft. from the mouth of adit the first cross cut is put in on the hanging side through the elvan. The elvan here is over 14 ft. thick, and the lode over 8 ft. thick. At 295 ft. from the mouth of adit another cross cut is put in, which shows the elvan to be 4 ft. thick and the lode to be 4 ft. thick. There is 3 ft. 5 in. driven in the striped cinder beds beyond the lode. Nos. 3 and 4 faults have a very important effect on the vein coming in; where two of the older faults join that of the Tyddyngwladis vein they create such a mass of joints and broken ground that the lode quite alters its character. It is here from 10 to 12 ft. wide, with good ribs of lead and zinc ores, in a matrix scotted with copper and iron pyrites, and also silver ore. It is here also that the shales occur which Mr. Arthur Dean speaks of as containing from 10 dwts. to 28 oz. of gold to the ton. [The paradoxides slates are separated by an elvan with a hanging wall of flookan, from a series of beds, which may be thus described:—No. 1. Loose material, such as fragments of slate, mixed with carbonate of lime, all embedded in clay.—No. 2. Carbonate of lime and quartz, with strings and patches of arsenide of iron.—No. 3. Blende, showing spots of silver ore in a matrix of calcareous quartz.—No. 4. Lead, with filmy tetrahedrite, in a matrix of quartz, mixed with green shale, cindery slate and carbonate of lime. The tetrahedrite is on the landing of the shales.—No. 5. Hard quartzose matter, full of sulphide of iron, which sometimes shows very good spots of silver ore. Then come the cinder beds.]

A little beyond No 4 fault a small north fault shows, which so alters the stratum as to make it appear a black schist. A small string of carbonate of lime marks the line of fault: it was against this string of lime that the lode made such nice strings of lead, beyond this small fault the lode only appears of an ordinary character, showing a little lead and blende mixed in a matrix of calciferous quartz and flookan. Between No. 4 fault and No. 3 cross-cut there occur three small north and south faults between Nos. 5 and 6 faults; the lode opens to a considerable width, in some places it is at least 12 ft. wide; this occurs in the No. 3 slate, which appears to make the lode much more argentiferous than in the No. 4 slates or paradoxides beds. [The section of the north-west face of No. 2 stope shows between the regular No. 3 slate and the elvan irregular masses of flookan, talcose schist, carbonate of lime, with strings of quartz and much sulphur, loose slate and flookan, and a deposit consisting of a mixture of lime and quartz, with good silver lead and spots of silver ore. These irregular masses seem to thin out towards the north-west.] Almost the whole of the lead hitherto found has been in the lode during its passage through the slates: very little has been found in the trap. By referring to the hill section it will be seen that the No. 2 level is all but in the No. 3 slates; these slates give the richest silver ore in the deep adit, so it may be that these slates will give ore as rich, if not richer, in No. 2 adit. By referring to section it will be seen that only two beds of slate have been pierced—No. 4 and No. 3 slates, and by referring to report it will be seen that No. 3 is far richer in silver than No. 4; the reason for this seems to be that No. 3 slate is felspathic, while No. 4 scarcely contains any felspar; if this law holds good Nos. 2 and 1 slates should be richer in silver than No. 3, owing to their being so very felspathic. I should strongly advise a trial of Nos. 1 and 2 slate beds, especially as important junctions take place in No. 1 slate.

CWMHEISIAN ISAF.—The different workings are described in the working sections explanation, and the character of the ground in the explanation of the geological section. Nothing of any consequence has ever been found here, and I may say that the character of the ground is such as to give but slight hopes of any important discoveries of the common metals being made, though from the frequent occurrence of the interbedded traps and felspar grits I am inclined to think that the precious metals may occur here, as they do at different places in this neighbourhood, associated with felspar rock. All the machinery is in good working condition. We have erected since the last meeting a round buddle, and a small water-wheel to work it; this buddle will answer very well for dressing the slimes. We have also put strakes and blankets to the stamps, so that we might stamp all the tailings and collect whatever gold and lead there might be left in them. These additions were only made a short time before the works were stopped the last time, so that their value cannot be stated. There still wants an amalgamator adding, to amalgamate the blanket washings; when this is done the works will be complete to treat the ores for both precious and common metals.

The Tyddyngwladis Company eventually went into liquidation without any debts or liabilities, and continued in liquidation for about the same period as the United Dolfrwynog Company. Since then the mine has been, and is now, in the possession of Mr. Holcroft, who has erected some well-made machinery there. What his success has been I cannot say, but in July, 1875, I saw some very rich specimens of gold which had recently been found in the mine; two or three of them were politely given me by Mr. Holcroft. That they are the produce of the place I have not the slightest doubt, for there are peculiarities about the Tyddyngwladis gold by which it can be easily distinguished from the gold produce of other gold localities of Merioneth. Besides, the specimens correspond exactly with others found by myself long before the present owner had possession of the property. I have no doubt whatever of the accuracy of Mr. E. Williamson's assay of the richest silver ore he found. I found a small quantity there myself which yielded over 2000 ozs. of silver to the ton of ore. The mineral is not apthonite as Mr. Williamson supposed. One of the specimens of gold ore I have from this mine contains, certainly, over 100 ozs. of gold to the ton.

This section is evidently paradoxical, but in one respect at least I am of the opinion of "Roberts—Miner"—"There's somebody's wealth in that mountain." T. A. READWIN.

THE CARN MARTH GRANITE RANGE.

SIR,—Just a line or two to say in drawing attention to the unwrought ground around the Carn Marth range of granite. It may not be out of place to state that about 30 years since the mines then working to the east were the United Mines, selling at 1000*l.* per share; and Great Consols, 600*l.* per share. To the west, Wheal Buller, 500*l.* per share. To the south, Tresavean, 525*l.* per share; Treviskey and Burrier, 415*l.* per share; and Lanarth and Penstruthal, 150*l.* per share. These were copper mines, the standard for ores then being 10 below the present, and there yet remains large pieces of unwrought ground traversed by the same productive lodes, which on being developed will unfold riches of equal value. A fortnight since I drew attention to West Poldice, in virgin ground, as having gone up in value from 2000*l.* to about 40,000*l.* in 12 months, and from discoveries of copper ore likely shortly to go to double its present market value. Time will not admit this week of writing more, but in my next will give further particular of this rich mineral district, there being other mines worked in a quiet manner which must ere long have an equal rise in market vaiue. Probably some of my numerous correspondents will take the hint that "time is money."

Poldice House, St. Day, Cornwall, April 6. CHAS. BAWDEN.

MINING SHARES.

SIR,—For many years I have taken an interest in mining, and have occasionally purchased and sold mining shares. Although in all instances my investments have not turned out well, I certainly cannot say I have cause to deplore or regret having turned my attention to or expended any capital in mines; on the other hand, I have been so far successful that I intend to continue not only to invest but, perhaps, even to speculate in mining shares. Of course I read the Journal, and in a great measure am dependent upon it for the information on which I act, but being well known to mining agents and brokers I am favoured with a great amount of gratuitous advice and information, which is generally supplied to me through the post in the form of a price list or investment circular, and it is curious to note the various opinions different persons appear to have respecting the mines and shares which are usually dealt in. Now, without troubling you with the lot of advice I lately received, will you kindly, if you are in a position so to do, explain to me why there are so many persons with whom I have no acquaintance constantly inviting me to buy shares in a mine at at least 100 per cent. higher than they are quoted in the *Mining Journal?* Surely I am not expected to buy shares at 2*l.* or 2*l.* 10*s.*, which are quoted at 1*l.* or 1*l.* 5*s.*, and are offered by the dealers even under 1*l.*

I am much inclined to think that those persons who are so very pressing with their advice are those alluded to some time since by one of your correspondents, who described them as "wolves in sheeps' clothing." There is one mine in particular which is brought before my notice almost daily, and from its position—or, rather, its supposed position—one would imagine it to be a very desirable speculation; but from the reports and quotations of the *Mining Journal* it appears to be too far overrated to suit the ideas or to extract the money from— A CAUTIOUS MAN.

London, April 3.

[For remainder of Original Correspondence, see to-day's Journal.]

Meetings of Public Companies.

THE GOVERNOR AND COMPANY OF COPPER MINERS IN ENGLAND.

The annual court was held at the City Terminus Hotel, on Wednesday,—Mr. JAMES WHATMAN (Governor) in the chair.

The report of the Court of Assistants regretted that the accounts display a very considerable loss as the result of the trading transactions of the company during the past year. The losses, shortly stated, are as follows:—

The loss on trading, including the London office expenses ...	£24,962 11 10
The direct loss from the three months strike of workmen ...	8,422 15 5
Reductions in value and adjustment of stocks ...	11,396 1 11
Total ...	£44,781 9 2

It is hardly necessary, in the face of the well-known condition of the iron and metal trades, to recapitulate the causes which have produced this state of the company's affairs. There is a point of satisfaction, however, that the plant, machinery, and works are in a most efficient state, and of a capacity to take advantage of any improvement that may take place in the trade.

The reports of the auditors stated that, with regard to the item called "new works," they are assured by the managing agent, confirmed by the court, that they are *bona fide* additions to the power and value of the plant, and not in the nature of substitutions or repairs, chargeable to profit and loss. The stocks are reduced to prices approximate to the market prices of the day of closing the books. The sum of 8691*l.* remains on the books as due from the Port Talbot Company.

The GOVERNOR said the proprietors must have anticipated that the report to be submitted could not be of a satisfactory character, as all must have known the unfortunate circumstances and the general depression that had taken place. They all knew that in the early part of the year there was a strike among the colliers, and the relations of these workmen to their employers were still, he was sorry to say, not so satisfactory as they should be. It was not very surprising that after so many years of comparative prosperity they should not be willing to submit to the reduction rendered necessary by altered values. The association of the men on the one hand brought about the association of the employers on the other; the men were all banded together, and if any of them turned out on strike they were supported by those in other places. On the other hand, the only way these associations of the men could be met were for the employers also to be associated. The necessary consequence was that there were general rules adopted, scale of wages, and so on, and, of course, those rules and those scales considerably tied their hands; that was to say that, though they might feel it necessary to make a particular reduction at any particular time, they were restricted from doing it owing to the necessity for acting in concert. That increased their difficulties, and involved many more difficulties in any step that it might be ultimately necessary to take. On one point he might congratulate them, and that was that, under so unfavourable a state of things, they had so managed that the losses this year had not been so great, although the markets had been worse than they were last year. He thought they would accept that as some source of congratulation. It was quite true that, in the sum which was put down as the deficiency on the year's working, a considerable portion of that had been on new works. The necessity for new works arose from the conditions of the company. They had no reserve fund, and were obliged to divide all the profits when they were made; consequently, all maintenance of the machinery and all new works had to be provided for out of the income of the year. That, of course, fell very hard upon them in the time of a deficiency; on the other hand, unless it was met in a provident spirit, the works would be continually going down, and they would not be in a condition to meet more favourable circumstances when they arose. Another difficulty that occurred to them in proposing any change, if they could agree upon any change as being desirable, arose from the fact of their having two classes of proprietors, whose interests were not always perfectly similar. The general interest, of course, must be the same, but it would readily be seen that when there were two classes of people and various differences of mind, it was impossible for all to agree on one common course. They paid 100,000*l.* a year for wages, so that it would readily be seen what a great difference a small reduction would make. Sixpence per day, reckoning 300 working days to the year, would amount to 15,000*l.* per annum. If reductions of this kind could be carried a little further, it would be seen what a considerable difference it would make to the company. A professional report was made some five years ago when one of the important principles laid down was that there had been a disproportion in the class of the works, to which was attributed the cause of the losses sustained—there was a great excess in the mechanical power, and concurrently a deficiency in the supply of materials. The consequence was they had to buy coal when dearer, and iron when it was still dearer; from that time to the present they had continually endeavoured to equalise those parts, and to arrive at a better proportion in the means of their productive power. In coal there had been a very considerable improvement, as to the future, but such works always took a long time before they became reproductive. Those developments were still going on, but they could not look to any very important return from those works immediately, and the quality would be better, judging from the large quantity left unworked in previous years. He had mentioned these things to show how necessary it was when a course had been once adopted to persevere in that course as far as possible. One of the former mistakes had been that after a certain course had been adopted to subsequently alter and waver. In former years there had been a considerable amount of remissness and laxity about the works, probably the consequence of former prosperity under Mr. Gilbertson's successful management. The present manager had had very considerable difficulty in approaching a better state of things, but the prospects of success were very encouraging. Taking all things into into consideration, he thought that the proprietors would say that looking to the general state of the market, the general depression of the coal and iron trade, the report now submitted, bad though it be, was not so bad as it might have been while it held out some ray of hope for the future. The Court regretted that in their report no reference had been made to the improvements in progress at Port Talbot, which was their port of shipment. Last year arrangements were made with their landlord, Mr. Talbot, who had most materially assisted them in improving the port by handsomely finding money which they could not find themselves. Having suggested that some shareholders should be selected to confer with the Court of Assistants, he moved that the report and accounts be received and adopted.—Mr. VILLIERS seconded the proposition.

Mr. ALEXANDER BEATTIE said, as an auditor, his acquaintance with the affairs of the company had been somewhat lengthy, and the Court had his deep sympathy in the unfortunate report presented. Those who knew the condition of the metal trade could attach no possible blame to the Court. (Hear, hear.) He did not think they could do better than adopt the suggestion that some of the older and larger shareholders should in a friendly way meet the Court and look at the various circumstances in the face, and try to determine as to the future, because it was clear they could not go on losing money to the extent they had done in previous years. It was equally clear they were unable to avail themselves of the advantages of the expenditure already incurred without further capital. As to the port, it was a most generous act on the part of their landlord to come forward and make that port available for the purposes of the company—that was one of the favourable prospects of improving their position.

The GOVERNOR, in reply to a question, stated that about 34,000*l.* would have to be expended upon the breakwater and dredging the port, and Mr. Talbot was now going to put up coal pits, which would be most valuable to the company. The former Court had thought themselves justified in guaranteeing on the part of the Cwm Avon Company an amount equivalent to the tolls saved by the facilities rendered to import the ores; 5 per cent. was paid on the guarantee.

Mr. GILBERTSON was last week in the neighbourhood of the works, and accompanied by the harbour-master visited the port. He found vessels could come in with facility that could not do so before; and from what he could gather from the contractors' engineer he believed one of the misfortunes of the past year which the company had encountered had been the closing of the dock now and then. True, the loss last year had been considerable, yet there was a large amount of property still untouched. He could not imagine a better course than that some large shareholders should meet the Court and determine upon some course as to the future.—The report and accounts were received and adopted.

Sir W. Baynes and Messrs. H. Waite, J. Schofield, A. Beattie, G. Weild, Henry Butler, and W. Gilbertson were appointed to confer with the Court of Assistants.

Major H. W. S. Stewart and Mr. E. P. Stringer were re-elected members of the Court of Assistants, and Mr. C. R. Mansell Talbot, M.P., was re-elected deputy-governor.—The auditors were re-elected.

A vote of thanks to the Court of Assistants was passed, and the meeting separated.

CENTRAL SWEDISH IRON AND STEEL COMPANY.

The fifth general meeting of shareholders was held at the Terminus Hotel, Cannon-street, on Tuesday,

Mr. THOMAS BAGNALL, Jun., in the chair.

The report of the directors stated that the accounts show a loss on the year's operations of 8829*l.* 18*s.* 9*d.* The principal causes of this loss have been—1. The working up of the stock of ores and other materials taken into the accounts at Jan. 1, 1875, at cost prices, or the extreme high prices prevailing in 1873 and 1874.—2. The continued depression of the steel trade in Sheffield, which made it impossible to sell more than a small quantity of Bessemer ingots, and thus the company were compelled to make pig iron for sale during a considerable part of the year.

The quantity of pig iron made during the year was 5542 tons, of which 2525 tons were converted into Bessemer ingots. The furnaces are capable of making 8000 tons of pig-iron for Bessemer steel, or pig iron for sale, 7000 tons per annum. One cause of the limited sales of the company's Bessemer steel is, that with the present machinery steel ingots only can be produced, for which Sheffield is the sole market. The manager in Sweden and the selling agent in this country have advised the board that if steam-hammers were erected at Bjorneborg by which the ingots could be hammered into slabs and bars, there would be a ready sale for the same both in Sweden and on the Continent at much better relative prices than are obtained for the ingots at Sheffield. The cost of the steam hammers and other appliances would be about 5000*l.* The following table shows the cost of pig iron and Bessemer ingots during the past year, as compared with the costs during the previous periods:—

PIG IRON.

	March, 1873.	March, 1874.	Dec., 1874.	Dec., 1875.
Ore	£1 16 2	£2 3 3	£2 5 4	£2 7 5
Charcoal	1 11 8	2 14 6	2 11 5	2 7 11
Wages	0 7 9	0 8 7	0 9 10	0 11 1
Stores and sundries		0 4 7	0 7 3	0 8 3
Total cost at works	£3 15 7	£5 10 10	£5 13 10	£5 14 8

BESSEMER INGOTS.

	Dec., 1874.	Dec., 1875.
Pig-iron (less recovered scrap)	£6 19 9	£6 13 4
Fuel	0 12 2	0 7 8
Wages	0 13 1	0 11 1
Stores and sundries	0 18 0	0 11 1
Total cost at works	£9 3 0	£8 3 2

[The above costs are exclusive of improvements and repairs, charges of management in Sweden and England, and interest on loans.]

The directors succeeded in selling the Frotuna estate in the month of December last, to take effect from Oct. 31 previous, for the sum of 22,258*l.* 5*s.* 4*d.*; and, as there were mortgages on it to the amount of 16,980*l.* 17*s.* 1*d.*, the surplus received, and to be received by the company is 5277*l.* 8*s.* 3*d.* The stocks on hands and debts due to the company were sold for an additional sum of 5519*l.* 10*s.* There was also received for the sale of materials, provided for the extension of the works at Frotuna, the sum of 1652*l.* 12*s.* 10*d.*

By the sale of the Frotuna estate, and by the sums borrowed in England on security of the stocks on hand, the mortgages and current loans in Sweden were reduced from 76,757*l.* 6*d.* 11*d.* to 45,546*l.* 17*s.*

The lenders of the temporary loan of 15,000*l.* referred to in the last report as repayable on Oct. 15 last, renewed the same for six months longer, and it is now payable on April 18. Some of these lenders have given notice to the company that they will not renew their proportions of this loan. This temporary loan of 15,000*l.*, and the very considerable loans obtained on security of stocks of iron and steel in England, amounting in all to upwards of 40,000*l.*—the interest on the whole being at the rate of 6 per cent. per annum—have enabled the directors to carry on the company's business during the past year without attempting to issue debentures at 8 per cent. interest, as proposed in the last report.

As provision must now be made for paying off a large proportion of the above loans, and also the bills payable, amounting to 5303*l.* 4*s.* 8*d.*, the directors have come to the conclusion that in reviewing the whole circumstances and present position of the company there is no alternative but to go into voluntary liquidation, whereby the stocks could be greatly reduced, and the bulk of the loans referred to paid off from the proceeds—the estates and works being held either for sale at a more favourable time, or for reconstructing the company should a sufficient body of the shareholders and others come forward with a scheme for the purpose.

The CHAIRMAN said it had been the desire of the board to present the accounts at as early a date as possible; it was necessary they should be presented thus early, because it was absolutely necessary to come to some decision as to the future of the company. The whole operations had resulted in a loss during the past year, amounting to 6829*l.*; that could be explained away in some respects. The prices of the raw material used for making iron had made it impossible to produce pig-iron and steel at a price at which it could be sold at a profit, and had they made the quantity of steel the works could turn out a sale could not have been got for it; the difficulty of selling was chiefly because it was so far that they could turn it out only as ingots. The quality was good enough, and had answered well all purposes, but the demand had been insufficient. There was a proposal to erect hammers at a cost of 500*l.* Since the last meeting one of the estates had been disposed of, and the proceeds apportioned, as shown in the report, the last instalment falling due in May. The lenders of the 15,000*l.*, or some of them, had given notice to call it in, and if the company paid part the whole would have to be paid. Mr. Fletcher had also come to the length of his tether, and would not lend more money: they had still to be paid back the money advanced on the stocks. The secret of the failure of the company had been that it was started at a time when everything was high in price, and the article produced correspondingly low, and they were suffering from a combination of circumstances which no one could have foreseen nor averted. The capital would have been ample if the works could have been built at the cost calculated; stocks were laid in at the highest prices, and, unfortunately, the trade had turned against them, and getting from bad to worse, bringing them into their present position. At the same time their works were conducted extremely well—the blast furnaces had done everything expected of them. As he had already said, the steel had answered very well indeed; it was remarkable its regularity since the mixture had been understood. He then moved that the report and accounts be received and adopted.

Mr. W. H. BURNAND seconded the proposition. Their misfortune had been that trade was against them; they must now do the best they could. Without they got capital it was perfectly clear they could not go on, the alternative being to wind up.

Lord DUNSANY had never heard a more straightforward statement from the Chairman of a company that had been brought into an unfortunate condition by extraneous circumstances. If the shareholders were misled it would be entirely their own fault. Speaking for himself, he rather wished some suggestion should be made by the board, who were masters of the situation. The question to decide was—should the works be carried on?

The CHAIRMAN said it was a great relief to hear such remarks from his lordship, because the board had worked hard for the company. It had been most ably conducted by the managers, who had placed everything before the board in a most straightforward manner. Everything had been done that could be done, and as the representative of the board he could say he was glad to find it had met the approval of the shareholders. As to the continuance of the works at the present time, there was no doubt that was an important subject. There was certainly some relief just now from the price of ironstone being rather less, and also charcoal; but, at the same time, he believed they could not produce pig-iron except at a loss. This, however, was a question which would better be discussed at the special meeting.—The report and accounts were received and adopted.

An extraordinary general meeting was held for the following purposes:—To consider in what way means can be raised for carrying on the business of the company, and, if approved, to adopt any resolution that may be submitted on this subject. To consider and, if possible, resolve upon the following special resolution—"That the company be wound-up voluntarily under the provisions of the Companies Acts, 1862 and 1867, and that a liquidator or liquidators be appointed for the purpose of winding-up the affairs of the company."

The CHAIRMAN explained the financial position of the company, stating that it was necessary a capital of 70,000*l.* should be provided to satisfactorily carry on the works. That seemed a large sum, but it was not additional capital, but rather the borrowing of capital in this country instead of abroad; the additional capital was about 14,000*l.*

Mr. MACKAY (of Messrs Fletcher and Co.) pointed out that 26,000*l.* was absolutely required at once to make the company safe, and to proceed with the works 67,000*l.*—Mr. BOYD said George Stephenson once said to him—"Sell your mine if you can; if you can't, make pigs; if you can't do that you would be a ——fool to manufacture iron." (Laughter.) He (Mr. Boyd) was of opinion that by putting up hammers and making bars they would largely increase the supply but not the profits.

The CHAIRMAN mentioned that something like one-third of the shares were held on loan by bankers; therefore, they could not take *pro rata* interest in a new company.—After some further discussion, a resolution was passed that the company be wound-up voluntarily.—Mr. Mackay was appointed liquidator.

A vote of thanks to the Chairman and directors closed the proceedings.

JAVALI COMPANY.

The eighth ordinary general meeting of the shareholders of this company was held on Friday, March 31, at the Cannon-street Hotel,

Admiral Sir LEOPOLD G. HEATH, K.C.B., in the chair.

The notice convening the meeting was read by Mr. SCHUBERT (the secretary); the director's report, which had been circulated was taken as read.

The CHAIRMAN said—Gentlemen: Although this report is not of quite so favourable a nature as we had anticipated when we last met you in this room, it will, nevertheless, take its place in the history of the company, as being the first which has shown a real profit on the year's working beyond the sum necessary for paying the interest on the debentures. The profit shown in the balance-sheet amounts to 881*l.* 17*s.* 8*d.*; but the estimated value of gold received for the month of December turned out to be 23*l.* less than its real value—so that profit becomes greater by that 23*l.*, and the right sum should be 904*l.* 17*s.* 8*d.*; but, if you would add to that 1699*l.* paid as interest upon debentures, you will get a sum of, in round numbers, 2600*l.*, as the real profits of the year, which is rather more than 3½ per cent. upon the whole capital of the company. We have spent that 904*l.*, and considerably more than that, in accordance with the views put forth in the second paragraph of the report in "perfecting and increasing the machinery at the mine, with a view of obtaining larger gross returns." The first sum which we have expended on capital account is 200*l.* in the purchase of land; that purchase was made, I must say, improperly by the manager, and without any communication whatever with the board. He has, however, explained that it is the completion of the purchase of a plat of land (of which Dr. Siemens had already obtained for the company one portion), and that it is mainly covered land, and may, therefore, eventually be very valuable; but, more than that, it is close to our property, and if we had not bought it someone else would have done so, and that there would have been grog shops and inconvenient neighbours closer to us than we wished. Therefore, we thought no more about it. The other sums are—1895*l.* for machinery, and so for various small and permanent items, all properly chargeable to capital account. The 1895*l.* went principally in the purchase, freight, and setting up of the new 35-horse power steam-engine for working the 30 stamps, besides the actual cost and freight of the engine and setting it up, it was necessary to build a shed to cover it and protect it during the wet seasons, and there is a large quantity of galvanised iron roofing which is paid for out of that sum. The balance was spent in erecting the 10 extra stamps which were purchased some years ago, and which have been lying on the ground until now, and which cost about 300*l.* to mount and put in their places. I do not know that I have much more to say on the subject of the balance-sheet. Both the balance sheet and the revenue account have been altered, and I hope you will think improved in form. We have separated the revenue expenses, and shown you the actual wages and salaries distinctly, and the cost of stores, mail services, freights, and other incidental expenses are shown in a separate item. The former practice has been, I think, to lump the whole in one item. This item of stores, mail service, freights, &c., 3289*l.*, is a rather large sum; but the board give the greatest attention to the purchase of all stores sent out, and we have here a list of stores sent out between October and December last, the total cost of which has been 192*l.*, and these very same items sent out at a former period cost 274*l.*—so that there has been a saving there of 82*l.* even upon that small sum. I will now call your attention to the letter of the auditor attached to the accounts. Mr. Woodhouse sometime ago—a year or two I believe—established a new form for the accounts which were to be sent home from the mine. That new form is closely adhered to, and the accounts came home apparently very well made out, and very correct on the whole, as far as we know; and I think they do credit to Mr. Chambers, your accountant out there. But I find last year there were no certifying vouchers for the amounts. The principal expenses are the wages, and your pay-sheet is prepared by Mr. Chambers, the account-taker, and certified by the manager; but for all the items of small stores there are no vouchers, and we directed vouchers should be sent. The things are bought from natives and Spaniards in small quantities, and probably they are not used to such a thing, and Mr. Woodhouse says that some of the vouchers are missing. However, another letter will be sent out, and no doubt the matter will be corrected next year. The next point is satisfactory—it shows that the expenditure upon capital account has not been thrown away. We called for an inventory in the early part of last year, and we received it made up to June; we received it in September, and it shows the total value of the stores and machinery and things of all sorts out there to reach the sum of 29,238*l.*; therefore, in addition to the money spent in purchasing the mine and so on, you have actual property out there to that value. I think that is all I have to say, on this point. Perhaps the next thing will be to discuss what the prospects of the mine are. I think the only way to discuss that is to look at the real past facts, and leave you, gentlemen, to draw your own inferences as to the future. We have ventured to say in the report—"Capt. Sohns has now at his command, and in perfect working order, 30 stamps and an excellent steam-engine; and unless the quality of the ore should permanently fall off the board see no reason why his repeatedly expressed conviction—that a gross annual return of upwards of 20,000*l.* could with these appliances be realised—should not be verified during the coming year. You must remember many prophecies of this description from Captain Sohns, but I will read the latest, dated May 27, 1875, "Prospects of profits on the basis of actual results, not only on the last, but all previous years, lead me to call your attention to the following items: from 1866 up to Jan. 1, 1875, they show as follows—1126 days' working, average of 15 stamps, crushed 48,775 tons of ore, yielding 18,584 ozs. of gold, upon an average of 17 dwts. 16 grs. per ton, so if 30 stamps had been at work, which now will be the case, the result will show for one year of 275 working days (deducting the remainder for Sundays and other holidays) 8509 ozs., which at an average price of 52*s.* 6*d.* would amount to 22,306*l.* 2*s.* 6*d.* sterling." We have inserted in the second page of the report a small table, showing you exactly what has been the result of the last three years working, and if you will divide the value of the gold realised by the number of tons crushed, and also the expenses by the number of tons crushed, you will get the following figures—you will get first the value of the gold realised for each ton crushed, 16*s.* 11*d.* in 1873, 19*s.* in 1874, and 18*s.* 2*d.* in 1875. You will get as the expenses, exclusive of machinery, that is the working expenses, for each ton crushed—17*s.* 1*d.* in 1873, 16*s.* 11*d.* in 1874, and 14*s.* 1*d.* in 1875, deducting the numbers in the one column from the numbers in the other column, we get in 1873 a loss of 2*d.* per ton, in 1874 a gain of 2*s.* 1*d.* per ton, and in 1875 a gain of 3*s.* 3*d.* per ton. Now, to my mind that is very encouraging. We are rather frightened at the present moment by the falling off in the value of the ore crushed during the past few months, but if you will look at those figures they show that in 1873 the value of a ton crushed was 16*s.* 11*d.*, and during the next year it was 19*s.*, and that of last year, notwithstanding the falling off, the average value was 18*s.* 2*d.*, showing that, on the whole, of the last three years the middle year was the best, but only a little better than last year, and that last year was richer ore, on the whole, than was worked up in 1873. Looking through the manager's reports and results since the formation of the company, I find this is by no means the first time we have had this low grade of ore. The quality of the ore crushed seems to vary much; we have had it down to 4 dwts. at one time, and we have had it on one occasion as high as 15 dwts. Now, we know that Capt. Sohns had accumulated during the last dry season, when he had only a little trumpery steam-engine scarcely able to work ten stamps, 4000 tons of ore to work up this season, and although he does not tell us so (and it is a misfortune it takes so long to communicate with the mine, for we have been unable to find out from the manager whether he has or has not worked up the 4000 tons of good ore long ago), I suspect that with his 30 stamps, instead of 20, he has run through the good ore for some months, but that is my speculative opinion. I have nothing in his report to lead me to suppose that it is so. What we know, then, is that there has been a progressive increase of profit from a loss of 2*d.* to a gain of 3*s.* 3*d.* in the last three years, and we know that during the last dry season of 1875 scarcely any work was done, and there was a loss of the sum of 77*l.* upon the three months' working. We know, then, in 1875, with 30 stamps available for working, not only during the last half of the year, as was the case in 1875, but during the whole of the working year. Therefore, I think and hope that our estimate of a gross return of 20,000*l.* may not prove wrong in the result. The next paragraph in the report refers to the tailings—you will see all the board have to tell you upon that. The first of the tailings sent over here—which naturally caused much excitement—were taken before the whole of the reduction works had been gone through. You know the process is not a single process; the ore is passed through the stamps with quicksilver, then on to copper plates, and finally ground by the machinery called an amalgamator; but, as far as we can ascertain, the first and second sets of tailings were not taken till after all the processes had been gone

through. The last lot, which showed 13 dwts. of gold and some ounces of silver, is taken with more care, after going through every process of reduction, and represents exactly that which has hitherto been thrown away. The financial scheme which we submitted to you at the end of January has been replied to by rather less than half of each description of shareholder and debenture holders; out of 275 shareholders 126 have sent in assents; of the preference, 29 out of 69; of the 10 per cents., 28 out of 66; and the 7 per cents., 39 out of 77. You must be aware that a scheme of that sort cannot be carried out without the individual consent of every person in the company. If we had received assents from nine-tenths, or from almost the complete list of the shareholders and others, we should have gone to the others individually to see what they would say; but with this state of the list I am afraid we must drop the scheme; at all events in the present shape. Our solicitor tells us it is impossible to carry it out without entire unanimity, he might do the thing by breaking up the company and forming a new one, but I doubt whether it will be worth while to disturb the arrangements so much. The main point was to put off the payment of the debentures; that can be attained without any special scheme by sending to the debenture-holders. There was another important point to get rid of—the 15 per cent. interest on the preference shares; a payment cumulative, it is true, but a payment which would only be made after all the liabilities of the company were paid. Therefore, the 15 per cent. would be a long way off; and we thought it would be to the interest of the preference shareholders to get a present 10 per cent., with a lien on the company which a debenture would have given them, in preference to what they have now; and it would have had this advantage to the company, that although it would have had to pay 500*l.* a year in interest on these new debentures, it would have saved by that a future payment of half as much again. However, I think we may consider the scheme as dropped. Now I am going to do what is always unpleasant, I am going to ask for some money. You may remember that at this time two years ago Mr. Sewell asked you for 5000*l.*, and he enumerated all the items for which that 5000*l.* was wanted, the principal ones being for the payment of the debts and the setting up of this steam-engine, and 30 stamps. You only gave him 2700*l.*, and now we want the balance of 2300*l.* We do not want it to set up stamps nor engines, that has all been done. Although you were asked for 5000*l.*, the main body of the work has been done with the 2700*l.* which you gave: I ask you for the balance to give us ready money. You will see we owed on Dec. 31, 1900*l.*, and we were solvent, because there was fully that amount afloat going from or coming to England. We ventured to ask the larger shareholders, holding to the amount of 200 shares and upwards to come and help us in our distress. We have received in answer to that appeal from only six gentlemen who had replied to it—we have received 195*l.*, and a promise of as much more from them. The directors have given them last year's fees of 300*l.*, and they are ready to give 200*l.* more, making 500*l.* as their subscription out of the 2300*l.* on condition that the other shareholders come in. Not only is it difficult to carry on the daily wants of the company without this money, but we really got ourselves into discredit. The manager is in the habit of taking from the German miners a certain portion of their wages to remit to their wives and families in Germany; from the nature of the transaction he cannot give us notice of that. Three months ago he had taken 300*l.* and put into the till, and afterwards 150*l.*, making 450*l.*, which was the till on the mine, and which we were bound to pay. But we had not the money, and we held back the money for two months, and I was so ashamed that I personally advanced 450*l.* Now I cannot go on with that, but you must come and help us out of the difficulty. I wish there had been a larger number of shareholders present, but I suppose we must send out another circular, and I hope you will help us not only on our account but your own. There is one other reason which induces to ask for this money, which is that if you do not give it to us we shall have to give up what is, at present at all events, a very great source of profit. You know that silver is very cheap at present; it used to be the custom for the manager abroad to draw a bill for his monthly wages, and that bill he paid heavily to get cashed, and lost considerably in cash out there, but it had this advantage that the board had not got to pay that money for some four months afterwards. We have taken advantage of the condition of the silver market, and we send out to him any advance of money he requires; we made last month 67*l.* profit upon that transaction. We have remitted some silver to go out this month, and we expected to make 80*l.* out of that, but if you cannot help us we shall have to give up that advantage, which is a real source of profit, and which we should be very sorry to give up. Gentlemen, I now move that the report and accounts be received and adopted.—Mr. CHARLES GREEN seconded the resolution.

Colonel MULOCK said that the first sample of tailings which was sent home by Capt. Solnis had misled the shareholders as to the value of the general body of the tailings. He commented upon two or three special points referred to in the report, and suggested that instructions should be sent to Capt. Solnis to send home half a ton of amalgam; then it could be ascertained whether it was really worth carrying on the mine or not.

Mr. CHARLWOOD asked whether the ground had been opened up sufficiently to provide ore for the 30 stamps?—Mr. MCKENNA thought a good deal of the unsatisfactory result was due to defective management at the mine.

The CHAIRMAN defended the management of Capt. Solnis in the difficult position in which he had been placed; the directors believed Capt. Solnis to be an energetic clever man, and, whatever might be his faults, want of zeal was not one of them; and if Captain Solnis had had the necessary amount of money years ago the company would have been in a very different position to what it was now. As to sending home a sample of amalgam the directors had already written out for it, and no doubt it would be sent over in due course. He then replied at length to the other observations, after which the resolution for the adoption of the report and accounts was put and carried.

The retiring directors, Mr. Charles Green and Mr. Robert G. Hall, were then re-elected. Mr. Woodhouse was re-appointed auditor.

On the motion of Mr. CHARLWOOD, a vote of thanks was passed to the Chairman and directors, and the proceedings terminated.

LONDON AND CALIFORNIA MINING COMPANY.

The annual general meeting of shareholders was held at the City Terminus Hotel, on Thursday,—Mr. LEWIS R. PRICE in the chair.

Mr. SAUL (the secretary) read the notice convening the meeting.

The report of the directors stated that the accounts made up to Sept. 30, after appropriating a portion of the profits to the payment of a dividend on July 15, 1875, leaves an amount standing to the credit of profit and loss of 7689*l.* The directors recommend that this sum be for the present retained. Since the report was written a letter had been received from the agents respecting the Original Amador Mine, dated San Francisco, March 8, in which they state:—"The reports from the mine this week are of a much more encouraging nature than any that we have lately had it in our power to transmit to you. The Gulch level has cut a vein of from 6 to 8 in. in width, with free gold visible in every piece of quartz that has been broken off. The ground enclosing the vein at the point where it has been cut is too hard to admit of so small a seam being worked profitably, but the mere fact of cutting quartz which carries gold so abundantly in the greenstone ought to give us hope that when we reach the main vein it will be found equally good. While the directors would not wish the shareholders to attach undue importance to this statement, they, nevertheless, think it their duty to communicate it."

The CHAIRMAN said the accounts being so very simple, he need not make many observations respecting them; the balance brought down from the previous half-year was 7253*l.*; the gain during the half-year—up to Sept. 30—was 8570*l.*: these two sums together made 15,364*l.* A dividend had been paid amounting to 8175*l.*, reducing the balance to 7689*l.*, which was the amount appearing in the accounts. Up to Feb. 29 they computed that the sum available for the mine was 11,000*l.*, but they had received a telegram that morning stating that the clean-up for the past month was $17,000; the telegram was as follows:—"Original Amador clean-up, 17,000; unchanged." That is to say, the mine was in the same state as at the date of the last report. They calculated that would leave a profit of 2000*l.*, increasing the balance to 13,000*l.* for prosecuting the exploratory works. Even the small dividend of 1*s.* per share amounted to 8000*l.*, and if they had divided another 8000*l.* there would have been left very little to carry on the works, as there was no capital. The mine was worked by two shafts—the Prospect and the Gulch. The Prospect shaft was the nearest to the northern boundary on Bunker Hill site. In driving a level north a deposit of ore had been found, from which the money in hand had been derived. From the Gulch shaft a level had also been driven northward, hoping that something of value might be met with; the level had been driven 150 feet below the second Prospect level, in order to test whether the body of ore found in that level had continued in depth. In that level nothing had been found *in transitu*, and when the desired point had been reached it was found the body of ore had not continued in depth. They had had considerable hope at the last meeting, as some of their neighbours had discovered a bunch of ore seemingly dipping towards Amador, and they had come upon some ground which might develope something fairly rich. It had given a good sum of money—they hoped when it was added together it would be something like 20,000*l.* Unfortunately, upon driving further the vein became disordered in the neighbouring mine approaching the Amador boundary; the same feature was observed in that direction, leaving very little hope of finding anything more. The principal feature to which the superintendent was now directing attention was the eastern vein, which was a considerable outcrop to the east. The Gulch shaft penetrated 400 ft. below the surface; the advanced level had been driven underneath the other works; at the extremity of the Gulch shaft cross-cuts had been driven eastward in the hope of finding the other vein. At the north end a small thin bunch had been cut, and, being in the greenstone, gave the hope that when the east vein should be reached it might be found productive. The thin vein was soon cut through, and the intention now was to drift on it to see if it widened out, but at the same time still continuing the cross-cut to the east. It had been considered necessary to concentrate all their efforts upon this work, and with this object Mr. Johns had suggested that the expenses at the mine should be confined as much as possible towards the development of this vein, and that the number of men should be reduced to about ten, and the monthly cost to something like $1500. Mr. Johns had declined to accept any pay as superintendent from the time when the bunch of ore, now being worked, had come to an end ceased to give a profit. Mr. Johns was willing to give his advice, but would not accept an emolument until something fresh had been developed. The board were anxious to secure Mr. Johns' services permanently, and had been negociating with him to act as adviser for the Sierra Buttes; if successful, they would have the advantage of his valuable services at a very small cost. He did not wish it to to be understood that they were about to entirely abandon all other works, as some other bunches might be met with, but it was very uncertain. He believed their future prospects rested principally upon what was found in the eastern vein. For some time past there had been 3000*l.* owing, as arrears of call on shares which were allotted; but certificates were never made out, nor the shares issued. On pressing for payment, Mr. Coulter offered to cover the amount, and so stated to a meeting of shareholders, by lending to the company 23,000*l.*; in fact, Mr. Coulter did lend the company 17,000*l.* Under the circumstances, the directors did not think the interests of the company would be served by forfeiting the shares, hoping that the money might be ultimately recovered. But of the 17,000*l.* Mr. Coulter had given up to the company 16,000*l.*—in other words, this amount was disallowed by the committee of enquiry, thus depriving him of the only source enabling him to pay the calls, and he now stated that he was utterly unable to take up the shares. This concern had been an enormous loss to him, and under the circumstances, seeing that there was no prospect of recovering the sum, the directors had proceeded to declare the shares forfeited. With regard to the report of the committee it was generally admitted that the interests of the company could not be served by its publication. The committee had reported the result of their enquiries to the directors, but had not thought proper to report to a general meeting. The labours of the committee had not been sterile, having resulted in obtaining 16,000*l.*, which came in at a moment when without it they would have been unable to continue the works at the mine. Setting aside the question as to who was to publish the report, the point to settle was—what object would be obtained by such publicity? If it contained any information that would be some reason why it should be published, but if the information which it did contain were never likely to serve the interests of the company it would be by its non-publication. He then moved that the report and accounts be received and adopted.

Mr. WRIGHT seconded the proposition.

Mr. SCHOFIELD enquired what amount had been paid up of the shares in arrears of calls?—The CHAIRMAN said that no deposit had been paid, nor had the shares ever been issued or the certificate signed.

Mr. SCHOFIELD enquired whether it was true that the report of the committee had not been published because the directors had been threatened with an action for libel by some parties mentioned in the report.

The CHAIRMAN said that as far as the directors were concerned such a statement was without foundation, but there had been rumours to that effect.

Mr. SCHOFIELD thought it was the duty of the board to publish the report.

The CHAIRMAN said the committee had been appointed to enquire into the affairs of the company, and if they thought proper to report to a general meeting to be called for the purpose. In fulfilment of that resolution the board wrote to the committee asking them if a general meeting should be called for the purpose, but the committee thought it would be unadvisable.

Mr. SCHOFIELD said the company had paid 350,000*l.* for a mine positively worthless at the time of its sale, for whatever ore had been discovered had been done by the shareholders. Had they paid only 50,000*l.* he should not have said one word about it.

Mr. BOLTON had never heard of a report being sent to a body of directors that was not afterwards published, although if it were thought inimical to the interests of the company he should support it.

The CHAIRMAN said the board could only be guided by their legal adviser, who told them what they ought to do.

Mr. SURGEY (a member of the committee) pointed out that in this case there was no want of confidence in the directors; on the contrary, when appointed it was with the object that the committee should work with the directors in all respects, and if thought desirable by all parties, that their report should be issued to the shareholders. It was satisfactory that 15,000*l.* had been recovered through the instrumentality of the committee for the benefit of the shareholders. The report had done that amount of good, and if the directors thought it was to the interest of the company the report should be published, he was quite sure the committee were in accord with the directors; but, on the other hand, if the directors thought issuing the report would be prejudicial to the company, he was equally sure the committee would be very careful in expressing an opinion on the subject. The committee saw no objection to the report being laid on the table at the offices of the company if the directors thought it advisable.

A SHAREHOLDER could not see any advantage in publishing the report if it would not serve some useful purpose.

Mr. WRIGHT (a director) said that the only purpose it would serve would be to pander to curiosity. The responsibility was with the committee, and not with the directors.

The SOLICITOR said that the report of the committee had been placed in his hands by the directors, and after a most careful perusal of it he thought the committee had acted most wisely, having regard to the interests of the company, in not presenting it to the shareholders. He saw no good to the company, while difficulties might arise by its publication.

Mr. SCHOFIELD asked if there was any special reason for dismantling the Erie Mine, and selling the machinery at such a low price? Had they capital, the Erie Mine was as likely to turn out productive as any other.

The CHAIRMAN said that under any circumstances a considerable time must necessarily elapse before operations could be undertaken at that mine; in that case, the machinery, if left in such a region, would be worth very little.

The report and accounts were received and adopted.

A vote of thanks to the Chairman and directors concluded the proceedings.

SIERRA BUTTES GOLD MINING COMPANY.

The ordinary general meeting of shareholders was held at the Cannon-street Hotel, on Thursday,

Mr. LEWIS R. PRICE in the chair.

Mr. JOHN SAUL (the secretary) read the notice convening the meeting, and the report and statements of accounts were taken as read.

The CHAIRMAN said that the accounts were of the usual character. They had earned a profit of 10,629*l.* 16*s.* 4*d.* during the half-year, which added to 12,171*l.* 7*s.* 3*d.* brought forward, increased the available balance to 22,801*l.* 3*s.* 7*d.* Out of this the directors recommended a dividend of 2*s.* per share, free of income tax, which would absorb 9750*l.*, after which there would be a balance of 13,051*l.* 3*s.* 7*d.* to carry forward, or 879*l.* 16*s.* 4*d.* more than on the previous occasion—that was to say, they had earned that amount more than they would pay as dividend. The report and accounts gave, he believed, all particulars that could be required. As the reading of the report may have been tedious to some of the shareholders, he would attempt to summarise it. Although the mine showed no falling off in quantity, there was a slight falling off in quality, the average yield being 86·49½ during the half-year as against $6·54, or about 2¼*d.* per ton difference. It seemed somewhat extraordinary that in the large number of stopes now open none had shown any improvement, but that did not argue that they would not find good ore further on. Much low-grade ore exists in the mine, and if none better were found than at present there would still be a profit. They were, of course, aware that the expense of working falls upon tonnage, and not on the value of the ore, so that they had really been working more cheaply, although the amount expended was somewhat higher, and they were led to expect that further economy was still practicable, and that a careful selection will raise the produce. There was much ore which they had to remove in the process of working the mine, so that if they only gained but $3 or $4 by working it was as well to treat it as to throw it aside. They were in treaty to engage Mr. Johns as superintendent, but the negociations were going on in San Francisco, and they did not know the result yet. No doubt this would produce some further economy in the working of the mine. The produce of the ore for the first two months of the present year was—in January $6·80, and in February $7·10 per ton, which was fully 1*s.* better than in the corresponding months of last year, and would alone be equal to 1400*l.* extra profit on the half-year. The improvement, as compared with the whole half-year, was equal to about the sum of 20*d.* per ton. The seventh level, which was being driven was not yet far enough in to find the payshoots worked in the upper levels. Their water supply had been continuous throughout the year, and proved the wisdom of investing a few dollars in dams, which was done a short time ago. The telegram from San Francisco that morning stated the month's run at $33,000; there had been a slight improvement at Willoughby's raise, but no other change, and everything was working. They really believed that if they obtained Mr. John's services they would have done all they could to bring the mine into a good position. As to the Plumas Eureka, their reports had not been confined to those of their own agents, but they had had the opinion of outsiders, and all concerned in stating that it was in a highly satisfactory position. The agent's report to Dec. 31 stated that the mine gave promise of steady improvement in the future. The prospects of the coming six months are better than at any time since the company had possession of the property. They were getting good results from the concentration of the sulphurets, and anticipated still better. In the lowest level the last accounts stated that the payshoot was widening, and looking better in every respect. Much difficulty had been experienced in working the sulphurets from the refractory nature of the mineral, but no doubt the difficulty would soon be overcome, as Mr. Johns and the agents thought that by extra roasting the yield would be increased. The January profits were $3170, or 640*l.* There was a piece of outlying ground beyond their mine which was thought worth locating, but as the proprietors could not find the necessary capital for the works required to retain possession it had been abandoned, and had now been located by Messrs. Cross for the company. It is now proposed to open the ground; the prospects of it are very good, and the new ground can be very readily worked through the company's present levels. The Eureka gives all reasonable hopes of being a lastingly profitable property. He concluded by formally moving the reception and adoption of the reports and accounts.

Mr. JOHN S. NEALL seconded the motion.

A SHAREHOLDER considered it an important matter that they had not reached the end of the economy they proposed to effect. He would like to know whether they proposed to replace their present superintendent by Mr. Johns, and what the latter is to be paid? He would suggest the payment of a moderate salary and a proportion of the results.

The CHAIRMAN could scarcely reply as to the removal of the present superintendent, for he had already said the negociations were at present pending at San Francisco. One of the superintendents, he believed, would go, as he had already expressed his intention of removing from the region as the climate did not agree with him. The services of the underground foreman were some times lost sight of, although he had much influence on the profits of the mine. Now, Mr. Johns states that the underground forman at Eureka was a very valuable servant, so that the board hoped his services would be retained. They hoped to place matters on a very satisfactory footing, and with regard to the payment to Mr. Johns, he had undertaken to superintend the two mines for 1200*l.* per annum.

The report and accounts were then unanimously adopted, and the declaration of a dividend of 2*s.* per share on the Sierra Buttes shares was proposed by the CHAIRMAN, and seconded by General GOSSETT.

A SHAREHOLDER proposed that the dividend should be 3*s.* per share, as they could pay that amount by borrowing only 150*l.*, which he offered to lend himself without interest.

The CHAIRMAN explained that they were actually without capital, and that 10,589*l.* of the balance was in the shape of stores at the mines. If 3*s.* per share were paid they might find themselves so pressed for funds that they would have to borrow money for the company's immediate requirements. After payment of the proposed dividend the available balance would be but 2386*l.* As to the amount of the stores, it should be considered but they must have large stores at the mine, because the mine could not be reached at some seasons, and if they had not castings and all other things in readiness when required they might find the mine stopped for months by a single break down.

The SOLICITOR said that apart from the undesirability of declaring a dividend of 3*s.* per share, the 148th clause of their Articles of Association prevented a meeting from increasing the dividend recommended by the directors.

The dividend of 2*s.* per share was then unanimously agreed to, and a dividend of 2*s.* per share on Plumas Eureka shares was declared.

Messrs. Charles Liddell and Charles Wright were re-elected directors, and the thanks of the shareholders having been voted to the Chairman and the board the meeting separated.

HENDREFORGAN COLLIERY COMPANY.

At the general meeting on March 28 (Mr. E. CHILCOTT in the chair), Mr. PERKINS (the manager) stated that the openings upon the diamond or brass vein are complete in every possible way, and are equal to an output of 200 tons a day. The coal is unsurpassed in quality, and is extensively used both in Kent and Ireland for malting purposes. He further stated that the coal could be made into a coke of better quality than any yet produced. It is now being used at works near Swansea, where they make steel bars and rails; they use at the present moment some 600 tons a week of it. Since articles as to the quality have appeared in the *Mining Journal* the number of letters which have come from abroad and various iron foundries have been very great, and there is no doubt it is a matter of very considerable good to the company.

Mr. WARWICK remarked that only 1*s.* 6*d.* per ton profit on 150 tons per day would give 15 per cent. on the entire capital.

The meeting recommended that the proposed issue of 500 shares be at once subscribed. Dr. Rogers and Mr. T. R. White were re-elected directors. A vote of thanks to Mr. Warwick for his services and time he has devoted to the company was carried unanimously.

Mr. WARWICK, in returning thanks, proposed a vote of thanks to the directors, which was carried.

After a few remarks from several present on the satisfactory condition the company was in, and the pleasing fact that the colliery stands out so prominently as having made a profit even in the universal depression, the meeting passed a cordial vote of thanks to the Chairman, and separated.

OLD TREBURGETT SILVER-LEAD MINING COMPANY.

The general meeting of shareholders was held at the company's offices, St. Helen's-place, yesterday—Mr. T. A. MASEY in the chair.

Mr. F. R. WILSON (the secretary) read the notice convening the meeting, and the minutes of the preceding one, which were confirmed.

The directors reported that they had delayed for a few weeks convening the present ordinary general meeting of shareholders, in the hope that some mutually satisfactory arrangement would be settled between the two sets of lords and the company as to a permanent reduction in the dues, and the efficient working of the mine in depth. They regret to report that every overture and every plan that has been suggested to Mr. Tucker has been refused, and there does not appear at present any prospects of Mr. Tucker ever endeavouring to make any concession. For the last 18 months the directors have been unceasing in their efforts to induce the lords to reduce their dues, but without success. The position of affairs is briefly this: Mr. J. Tucker, of Branscombe, Sidmouth, in the year 1863 obtained a lease of the Old Treburgett Mine at 1-18th royalty; subsequently he granted a sub-lease at 1 10th royalty, under which the company now work. At the deepest part of the mine the lode has dipped into other land, which Mr. Tucker lately purchased, and leased the same to the company at 1-15th royalty, on condition that the two setts were to be worked as one mine, the ores and stuff beneath being drawn to surface through the Old Treburgett shaft. The original Old Treburgett lords, or landlords, object to this, and demand from Mr. Tucker, as a condition of granting a way-lease through the shaft in their land of the ores obtained in Mr. Tucker's, that he should reduce the royalty on the sub-lease, until all the ore is worked out of their land; and afterwards that he should pay them 200*l.* per annum for the use of the shaft in drawing the ore, &c., from his land. This proposition, which appears to the directors a reasonable and business-like settlement of all questions in dispute, Mr. Tucker simply declines, without making any counter proposal, and here the matter stands. The directors are also waiting to hear from Mr. Tucker as to what steps he proposes taking to remove the stop order served on the company by the original Treburgett lords, not to draw Mr. Tucker's ore through the shaft. In the meantime three valuable levels, the 9*s*, 80, and 70, cannot be worked because of the stop order.

It greatly surprises the directors that Mr. Tucker cannot see the large pecuniary advantage he will forthwith derive from the development of the mine beneath his land. Under these contrary circumstances the directors will be glad to receive any practical suggestions from the shareholders. The directors regret that a reference to the balance-sheet will show that the ore raised during the past year has realised less by 4115*l.* 0*s.* 4*d.* than in the previous 12 months. About 400*l.* is accounted for by the fact that the dues since Sept. 29 have been paid in kind, and the remaining difference is caused by a reduction in the price obtained and less ore raised; this has resulted in a loss on the year's working of 1434*l.* 2*s.* 1*d.* A careful perusal of Capts. Hancock and Bryant's report will show that the mine is looking well, and there is no cause for anxiety as to its future development, provided a more liberal and less onerous rate of royalty is demanded.

The CHAIRMAN said this would be an important meeting, as the future of the mine would have to be considered. They had made 1000*l.* loss on the year, which was about equal to the deduction of royalty asked for; but at present the lords were disinclined to make any concession. During the past year the directors had great difficulty in financing the company. He formally moved that the report and accounts be received and adopted.

Mr. P. WATSON enquired how much royalty the lords had received. They seem to have received 699*l.* in addition to what had been received in kind?——Capt. HANCOCK said the amount paid in kind since September had been about 400*l.*

The CHAIRMAN said that Mr. Tucker could not see that if he gave up a certain royalty on the Old Treburgett land he would really receive three times the amount of royalty on his own land. The real question is whether they should continue to work the mine or not? The directors wish to elicit the shareholders' opinion on the matter.——Capt. HANCOCK said it would require 200*l.* per month to keep the mine in fork.

Mr. BURBIDGE objected to the mine being carried on for the benefit of Mr. Tucker alone.

Mr. WILSON said that practically the lords were stopping the mine just as it was looking well. We have already practically stopped the 70, 80, and 90—that is, we are not drawing any ore from those levels, pending arrangements.

The CHAIRMAN said that the ore discovered was sufficient to ensure him against any loss from his concession. The directors had always told Mr. Tucker that in the event of his reducing the royalty the arrears should be paid forthwith.

A DIRECTOR said it was not a question of wayleave. Mr. Tucker adheres to his rights of his difference between the 1-18th which he pays and the 1-10th which he receives. The real question is his interest in the old lease. The old lords have felt that the sub-letting of the mine at 1-10th is to their prejudice, and especially as the ore is now working out of their property into Mr. Tucker's ground.

A SHAREHOLDER suggested that Mr. Tucker had never contributed a penny in cash towards the working capital of the company.

Mr. J. Y. WATSON understood that the stoppage of the mine would only be to bring Mr. Tucker to book, as the mine would be remunerative if the royalty were 1-18th instead of 1-10th.

The CHAIRMAN said that was the case. Mr. Tucker could never work his land

without sinking a new shaft, at a cost of 3000*l*. He would be glad to have any sugestion from the shareholders.

Mr. P. WATSON thought the best way was to adjourn the meeting and have a conference with Mr. Tucker. Where the liberal aid of the lord has been given the mines are doing the best. Twenty-five years ago Dolcoath was on its last legs, but by the lord's assistance it was carried through, and has become a rich mine. The same was the case with Mr. Robartes at Tincroft. There are the elements of a good property in Old Treburgett, but it must have capital. To secure this the lords must come forward and meet the adventurers, and then the lords might expect their dues to be doubled in a twelvemonth.

The CHAIRMAN said that the directors had met four of the lords at the mine, and an arrangement was suggested by the other lords, which Mr. Tucker simply declined.

Mr. J. Y. WATSON thought that the question was rather with Mr. Philp, who naturally feared that Mr. Tucker's land would alone be worked. There was 10,000*l*. worth of ore ready to be taken away when the difficulty with Mr. Tucker was settled.

The CHAIRMAN suggested that the directors should see Mr. Tucker, and determine upon stopping the mine unless a satisfactory arrangement could be made. He thought it best to pass the report and accounts, and call another meeting. A fresh meeting could then be called as special, at which the further information from Mr. Tucker could be received, and winding up determined upon if desired.

A SHAREHOLDER suggested that the mine could be kept working just so as to leave nothing for Mr. Tucker.

Capt. HANCOCK had no doubt that it could be so worked for many months.

The CHAIRMAN said it had been proposed that Mr. Peter Watson be elected a director.

Mr. WATSON would be glad to use his endeavours to settle the matter with Mr. Tucker, who, in his opinion, was pursuing a very suicidal policy. He thought it certain that if they obtained the necessary concession from Mr. Tucker, more capital would be required, and be forthcoming.

Mr. P. Watson was then appointed a director; Capt. A. B. Brown was re-elected a director: and Mr. C. J. Lee was re-elected auditor at 10*l*. 10*s*. remuneration, the proceedings terminating with the usual complimentary vote of thanks to the Chairman.

WHITEHAVEN IRON MINING COMPANY.

The half-yearly meeting of shareholders was held at the offices, East India Avenue, Leadenhall-street, on March 31,

The Right Hon. the Earl of DEVON in the chair.

The report of the directors stated that, as anticipated in previous reports, the opening of the Ravenglass and Eskdale Railway has enabled the company to more fully develope the working of the mines, and facilitated delivery of the iron ore. The continued depression in the iron trade has much affected the obtaining of orders for iron ore, and those received have been at a low price per ton compared with former sales. The average price realised for the ore sold during the half year amounted to 12*s*. 7*d*. per ton, as against 17*s*. 3*d*. for the previous half year, and 28*s*. 6*d*. per ton for the corresponding half-year of 1874. The directors, however, are enabled to state that after charging all expenditure to revenue (except 583*l*. paid in respect of calls upon shares of the Ravenglass and Eskdale Railway), and taking the stock of ore at a reduced price, there remains a balance, after clearing off the debit to profit and loss left at the preceding half year, of 53*l*. in favour of the company. The directors are using every effort to effect sales and deliveries of ore, the appliances at the mines being sufficient for a considerably increased output. The manager's report for the six months is appended, and also the usual plans showing the workings at the mines during 1875. The amount allotted on debentures of the company is 2100*l*., and the full liability of this company to the railway company upon shares has been met.

The CHAIRMAN referred to the depressed condition of the iron trade, stating that the price for the half-year ending last December was 12*s*. 7*d*. per ton as against 17*s*. 3*d*. for the corresponding six months of the previous year; therefore it would be seen that they had been labouring under great disadvantages. It was true the accounts showed but the small profit of 83*l*.; the small balance was in part owing to the fact that they had felt it absolutely necessary to conduct everything with efficiency, but at the same time with the most rigid economy, but now they were endeavouring to extend their trade in other directions. The connection with the railway had been made, and the line was now complete for goods traffic, and it was proposed to continue it for passenger traffic, which would be a benefit to the company because of the shares held in it. Without that railway it would have been impossible for them to have done anything. He then moved the reception and adoption of the report and accounts.

Dr. TREWHELLAR seconded the proposition, and congratulated the shareholders upon the improved position of the company.

A number of questions were put, chiefly by Mr. MESSENGER, after which the proposition was put and carried.

A vote of thanks to the Chairman and directors closed the proceedings.

LINARES LEAD MINING COMPANY.

At the half-yearly meeting of shareholders, to be held on Thursday, the following directors' report will be presented:—

The directors, in presenting their usual half-yearly report on the affairs of the company, are pleased to state that the account they have to render is of a very satisfactory character. The profit on the half-years operations has amounted to 8762*l*. 1*s*. 6*d*., made from two sources:—

On the mining operations	£7971	14	3
On lead ores purchased	790	7	3 = £8762 1 6

This amount far exceeds the profits of the previous six months, when the total gain was 3226*l*. 3*s*. 6*d*. The improved result has been brought about by the increased raisings of ore, a reduction in the mines costs, an improved price for lead, and better results in the smelting of the ores. Whilst raising a larger quantity of ore, the reserves for future extraction have been well kept up, and the mining prospects continue to be good.

Peill's shaft, which reached a depth of 105 fms., is a point of great promise, and is now in the most important section of the mine. The lode will in a few months be intersected at the 90 and 105 fm. levels, and there is reason to believe that the lode at both points will be productive.

Encouraged by the success which has attended the new explorations carried on during the past few years, the directors contemplate to unwater Old Pozo Ancho Mine, and deepen it 15 fms. as a commencement, and to go still deeper if the prospects should prove sufficiently encouraging to warrant the outlay. The old mine was poor when the company abandoned the deep workings many years ago; but as it proved so rich in the upper levels, the directors consider that the deeper ground in this mine deserves a further trial.

At the time the deep levels were abandoned, the price of lead was less than 18*l*. per ton. It is now 3*l*. per ton higher; the consequence is that ground which could only then have been worked at a loss will now yield some profit.

A branch line of railway has been in course of construction during the last two years from the Linares Station to the town of Linares, and from thence forward to this company's mines. The works are nearly completed, and in the course of a few months will it is expected be opened for traffic. This will effect a great convenience, and some economy in the transport charges.

The carriage of lead to the coast and its shipment to England have been carried on with great regularity during the half-year, and the produce has at all times met with a ready sale in England.

The directors are gratified to be able to pay so handsome a dividend as 10*s*. per share, and the balance then remaining to the credit of the profit and loss account will admit of placing 500*l*. more to the reserved fund, and of carrying forward to the next account 1004*l*. 17*s*. 1*d*.

FORTUNA COMPANY.

At the half-yearly meeting of shareholders, to be held on Thursday, the following directors' report will be presented:—

In presenting their usual half yearly report, the directors congratulate the shareholders upon the continued prosperity of the undertaking. Not only have the profits for several years past been large, but the finances of the company have gradually improved.

The profit for the six months to Dec. 31 amounted to ...	£11,955	12	7
For the previous six months	10,060	8	9
Making the year's profits	£22,016	1	4

On the capital of 50,000*l*.

Economies in working the mines and smelting the ores continue to be carried out, and these increase the profits. The mines are well provided with machinery, which is preserved in a state of great efficiency.

The quantity of ore raised has been 2317 tons 4 cwt.: during the previous six months it was 2302 tons, showing but a small variation between the two periods.

The works of trial have been carried on with the usual activity, and with encouraging success, as will be gathered from the fact that, after raising the above-named 2317 tons of ore, the reserves have not been diminished in quantity—they are again estimated at 7500 tons. During several previous half years the reserves of ore at Canada Inecosa had been diminishing; that mine, however, has lately improved in some important points, the result being that the reserves have been maintained at 1700 tons.

The smelting of the ore continues to be carefully and well done, and so soon as the lead is made it is dispatched to Seville, and shipped from thence to England. The transport arrangements have become so perfected, that there is seldom one month's make of lead lying at the the depots in Spain unshipped.

On the opening of the branch line of railway from the Linares Railway Station to the mines, the facilities of carriage will be further increased. This work is so far completed that the line might be opened almost immediately.

The half year's profit being so satisfactory, the directors have been enabled to pay an increased dividend—5*s*. per share, as compared with 6*s*. 6*d*. per share in October last. After payment of this dividend, and adding 1000*l*. to the reserve fund, which will then amount to 9562*l*. 3*s*. 9*d*., there will still remain a balance of 1004*l*. 2*s*. 10*d* to carry forward.

ALAMILLOS COMPANY.

At the half-yearly meeting of shareholders, to be held on Thursday, the following directors' report will be presented:—

The profit on the half year's operations to Dec. 31 last amounted to 5296*l*. 17*s*. 1*d*., which is more by 2408*l*. 12*s*. 6*d*. than that of the preceding six months.

This profit has enabled the directors to pay a dividend of 2*s* 6*d* per share, to add 500*l*. to the reserve fund, and to carry on a balance of 701*l*. 4*s*. 6*d*. to next account.

The causes of this increase of profit have been the reduction in the mines costs, the improved prices obtained for lead, and economies effected in smelting of ores.

In their recent reports the directors have had to refer to the unpromising character of the lodes in some of the important sections of the mines, but they have now very encouraging news to communicate, as great improvements have lately taken place, which give promise of being of a permanent character.

The lodes having continued poor for so long a time, the directors have been led to make an increased expenditure on the works of exploration since December last, and to apply the sum of 1000*l*. from the reserved fund towards defraying the outlay. The directors have great hope that these new trials will yield good results.

The rates of carriage have not been altered during the half year. There is the prospect, however, that in the course of a few months some reduction will be obtainable, as the branch railway, which will connect the company's mines with the main line to Seville, is nearly completed, and, it is hoped, will soon be opened for traffic. The lead market, although somewhat depressed during the past two months, has, on the whole, been good, and it is believed that the present price of lead will at all events be maintained.

Reviewing the past half-year's results, the directors feel that there is every reason to be pleased with them, and they entertain great confidence as to the future. The mines are good, the cost and labour of fuel is moderate, and with the present price of lead, satisfactory profits will continue to be made.

EXCHEQUER GOLD AND SILVER MINING COMPANY.

The report of the directors to be submitted at the forthcoming meeting states that the balance-sheet is a most complete record of the company from its registration, on June 28, 1869, up to the close of last year, here and at Silver Mountain. On its face it bears unmistakeable evidences of the fiery financial ordeals through which the Exchequer Gold and Silver Mining Company (Limited) has passed—not scathless, it is true, but with honour, persistent energy, good faith, and the unfailing pluck characteristic of English gentlemen—towards its present condition, which is unquestionably one of assured success to those interested in its well doing. These sacrifices, to which allusion has been made, were, no doubt, onerous in a capital sense, when we look back at them as a contrast to their present circumstances. But in all probability it may be generally assumed that they are more regarded in that pecuniary light at this period of our history than they were during the precise crisis when sacrifice became necessary for the safety of our enterprise. The gulf, however, is now closed, and it only remains for us to congratulate you that these epochs of financial trial have not been without decided advantages to those shareholders who bore the heat and burden of the past, while they have also secured for those who have more recently joined them the absolute promise of a rich recompense in the future. A rosier, and certainly, if you will, a more alluring aspect might have been imparted to this balance sheet, but the true facts relating to our company, as you are well aware, require no such "glamour" to veil the figures of a document which is, or ought to be, so essentially prosaic in its practical details. It is not an unusual feature for the annals of a mining company to exhibit a certain amount of debt. In our case this debt is trifling, and is entirely due here to members of the company, and our available assets if used for its extinction are in excess of the amount required. In the general interest, nevertheless, we desire to retain our reserve share capital intact for more important objects, a policy which we trust will meet your sanction and approval.

We propose by the special resolutions to deal with the English portion of these claims (as aforesaid held among yourselves) by an issue of bonds payable out of profits. The amount of outstanding debentures on Dec. 31 last (since considerably reduced) was 31,237*l*. 5*s*. Against this we hold specially 31,278 shares, the present market value of which being 54,686*l*., leaves no doubt as to the option which the debenture-holder will exercise when he may call for shares at par in exchange for his bond; in fact, many have already done so. The unallotted shares at the disposition of the company as a reserve fund are 5412, which even at the present moderate valuation are worth 9471*l*. as available capital. We look forward, however, with confidence to the time, probably not very distant, when the value of these shares may be considerably enhanced in public estimation, and thus supply us with the means to provide important additional machinery at the mill and mines, so as to increase the productive powers of both without encroaching upon your profits for these purposes. For this reason we suggest this issue of bonds payable out of first profits for the trifling amount due over here. In California the small sum owing can be met by the proceeds of ore now at the mill. At the mine there is also a quantity of rich ore on the dump, as well as large reserves in sight, which might have been imported into this balance sheet in the fallaciously deceptive form of estimates. We, however, entertain a very decided opinion that to do so would be contrary to straightforward business like dealing, and possibly open a door to a practice which in its ulterior consequences none of us could sanction, and no matter how amiable the original motives might be would inevitably prejudice your claim to public confidence.

Mr. Lewis Chalmer's annual retrospect of mining operations for 1875 has not yet reached this office, in consequence of his time being so fully occupied in pushing other matters forward. These details, of course, will merit attention, but their practical interest has been eclipsed by the rich discoveries subsequently made in the 200 and 300 ft. levels, which have opened up large bodies of ruby silver ore, ranging in value from 24*l*. 11*s*. 7*d*. to 163*l*. 11*s*. 9*d*., showing an average, according to Messrs. Johnson and Matthey's assay, of 9¾ per ton. If you allow 6*l*. per ton to cover all mining as well as milling expenses, with a fair amount of dead work to keep developments well in advance of the extraction of ore, and assume that after the new battery is erected, when the weather there moderates, we shall be able to manipulate 20 tons daily for 300 working days per annum, you will arrive at an approximate estimate of what the future of this company bids fair to accomplish for us in respect of dividends. It is, therefore, no matter of surprise that not only our own miners but also non-residents at Silver Mountain, in California, should be eager to obtain shares. Mr. W. G. Romaine, C.B., joined the board after having visited the mines, and became one of the largest shareholders. To his energy and influence we attribute much of the success which has recently crowned our endeavours to promote the welfare of this company here. In conclusion, we desire to tender our cordial thanks to all of our shareholders for the personal confidence and friendship which during these years of trial they have ever kindly manifested by word and act in connection with the affairs of your company towards us as directors and individuals. We cheerfully admit that without this mutual reliance and trust we might, as directors, have been left comparatively powerless to conduct your affairs successfully, and we take this opportunity to acknowledge these obligations, while we congratulate you all upon the brilliant results which are, without any doubt, now in store for us in the future.—(Signed) Earl PORTLETT, Chairman of directors.

[For remainder of Meetings see to-day's Journal.]

THE SPELTER MARKETS.—Notwithstanding the general dulness in the European and American metal trades during the past two years, the price of spelter has tended steadily and almost uniformly upward. The reason for this advance will be seen from an examination of the statistical position of the metal. In 1870 the general European production of spelter was 123,200 tons. In 1873 it was 129,000 tons, and in 1874, 142,560 tons. The increase in the demand has been more than proportionate to the increase in production, and although the shipments to this country have steadily fallen off, the price has continued to advance, and the smelters of England have made every effort to procure additional supplies of calamine from Spain. The production of spelter in this country has increased so much within the past few years that the importations have fallen from an average of 3400 tons to about 500 tons, and even this small quantity has had difficulty in finding a market in competition with the domestic, as the difference in price in favour of the latter has been about equal to the current premium on gold. The average price of domestic in this market last year was 87·04, currency per 100 lbs., while foreign averaged 87 23, gold. The prejudice in favour of foreign spelter, which so long retarded the introduction of domestic into general use, has practically disappeared, and it now readily commands 87 75, currency, while Silesian is quoted at 87 37½, gold, a price too low to leave any profit to the importer. In 1873 the domestic product was 7343 tons; in 1875 it had increased to 15,833 tons: but notwithstanding this increase its value here as abroad has continued to increase, thus extending every encouragement to the home producer. In Europe the demand steadily exceeds the supply, and it is safe to assume that it will be the same in this country, unless we go on doubling our production every two years. From all indications, it appears that position of antimony. For a great variety of uses, especially for architectural ornaments cornices, &c., it is employed almost exclusively. Its employment in theatres every year becoming more general, and it promises to acquire an increased utility in proportion to its abundance and cheapness.—*Iron Age* (New York).

FOREIGN MINING AND METALLURGY.

The further the spring advances the less favourable the prospects of the French coal trade appear to become. The waters have fallen and the navigations have improved, but the sudden advent of warm weather has checked the last purchases of winter, and the stagnant trade appears to entertain little confidence as to the future, and to give out its orders very sparingly. All these contradictory causes agitate the market without animating it, and discourage rather than maintain legitimate hopes. Whatever may be the cause, the fact remains that very few orders are given out, and that only small purchases are made to meet the requirements of current consumption. Prices show a downward tendency, especially for coal for metallurgical purposes, which is only in request upon this condition. Attention is being still directed to the best means of combatting explosions in mines. M. Leverrier has been pointing out the influence of fluctuations of the barometer upon the accumulation of fire-damp. The dividend of the Loire Mines Company for 1875 has been fixed at 14*s*. 6*d*. per share.

The revival which has been spoken of in the Belgian iron trade is not considered to have made much progress of late; prices are unremunerative, although they have been tending upwards rather sensibly. Merchants' iron is for the present in considerable demand in Belgium; Holland especially has taken rather considerable quantities. The manufacture of fine plates exhibits some activity. The Ougrée Forges and Rolling Mills Company has remounted a differential trio on the Louth system. Count Leopold d'Aerschot has just returned from Canada, where he had gone to negociate a contract for 20,000 tons of steel for Belgian works. The negociation was on the point of terminating favourably for Belgian interests when it was broken off by brokers acting on account of certain English firms, who offered to do business for at least 1*l*. per ton less money. The Meuse Construction workshops have just received an order for a drainage engine (similar to one erected some time since) for the Mariemont and Bascoup Collieries.

The revival which has been affirmed to have taken place in the French iron trade does not embrace the whole class list of irons usually offered upon the markets. Thus there is not much demand for merchants' iron, and if prices are sustained this is rather due to the desperate resistance offered by producers to any reduction rather than to any confidence in the present or future. M. Gauthier, civil engineer, has been discussing the relative strength of iron and steel girders, and he has come to the conclusion that if steel girders are used the thickness of the girders may be reduced one-fourth, while the weight which they are called upon to sustain may be increased two-thirds.

Coal quotations have presented little firmness in Belgium, and the deliveries, as well by water as by railway, are of the most restricted character. The trade has entered, in fact, upon the quiet season which usually follows the close of the winter. Coalowners are profiting from this to carry out preparatory works in steel, new machinery, and repair the damages which recent floods have occasioned in several workings. Consumers are beginning to conclude some contracts, as they see that a greater fall in prices can scarcely be anticipated. Coke is offered in the Liége basin at 16*s*. to 17*s*. 4*d*. per ton on trucks; washed coke is quoted at 17*s*. 6*d*. to 19*s*. 2*d*. per ton in the same district. The Lemielle ventilator has been introduced into the Grand Hornu Mines, near Mons. The imports of coal into Belgium in February amounted to 52,000 tons. The exports of coal from Belgium in the same month amounted to 272,000 tons, against 218,000 tons in February, 1875, and 200,000 tons in February, 1874.

Chilian copper has been a little better supported at Paris, but transactions have ruled feeble. Chilian in bars, delivered at Havre, has made 82*l*.; ditto, ordinary descriptions, 81*l*.; ditto, in ingots, 84*l*.; English tough cake, 84*l*.; and pure Corocoro minerals, 82*l*. per ton. Prices of copper have not varied materially at Marseilles; red Toka has made 80*l*.; refined, in small ingots, 84*l*.; and yellow, for sheathing, 84*l*. to 86*l*. per ton. In Germany transactions are confined to the strict requirements of consumption, and prices have slightly given way. Banca tin, delivered at Havre or Paris, has been sustained at Paris at 89*l*. 8*s*. per ton; Straits ditto, 79*l*.; and English, delivered at Havre or Rouen, 79*l*. per ton. At Rotterdam the tin market has remained extremely quiet, and no great amount of business has been doing. Banca has been quoted nominally at 49¾*fl*., and Billiton at 45½*fl*. to 45⅝*fl*. In Germany tin appears to have reached for the present its minimum quotation. A slight decline in lead at Paris has led to some increase of business. Lead has remained quiet and without demand at Marseilles. Zinc has been declining in price at Paris, but without much increase in the demand. Rolled zinc has not varied in price at Marseilles. Upon the German zinc markets transactions have generally made default to some extent, but quotations have been pretty well maintained.

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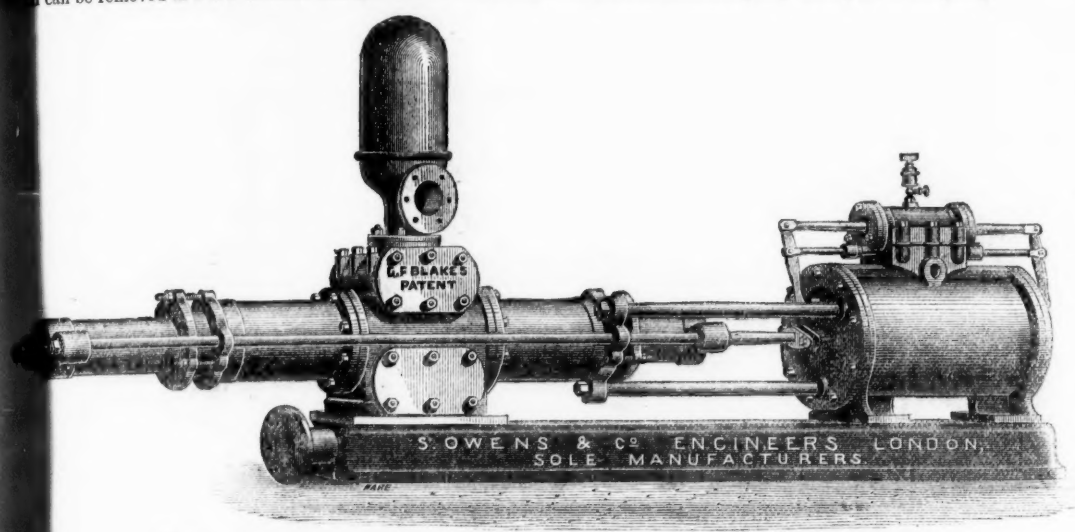

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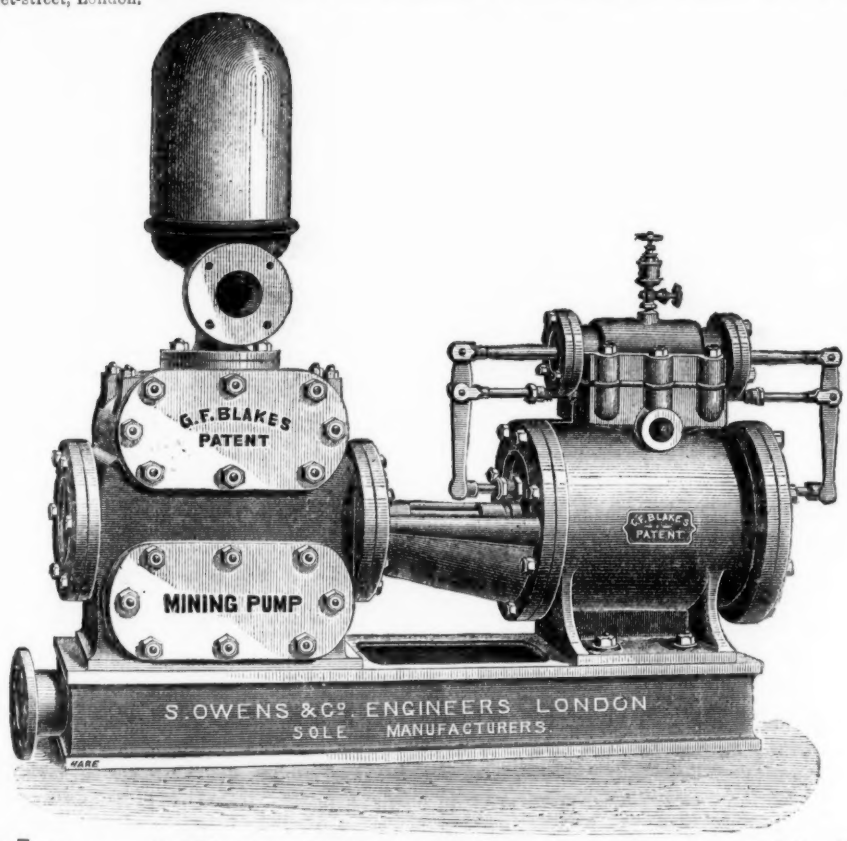

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Length of stroke ..... In.	18	18	18	24	24	24	24	24	24	24	24	24	30	30	30	30	30	36	36	36	42
No. of strokes per minute..	30	30	30	30	25	25	25	22	22	22	22	22	22	22	22	20	20	17	17	17	15
Quantity in gallons per hour, approximately ...	1440	2610	4200	5940	2940	4620	6600	2646	4158	5940	10620	2646	5160	7500	13260	4586	9000	12360	15660	6720	120

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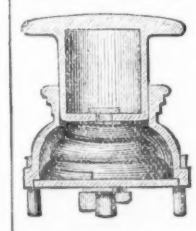

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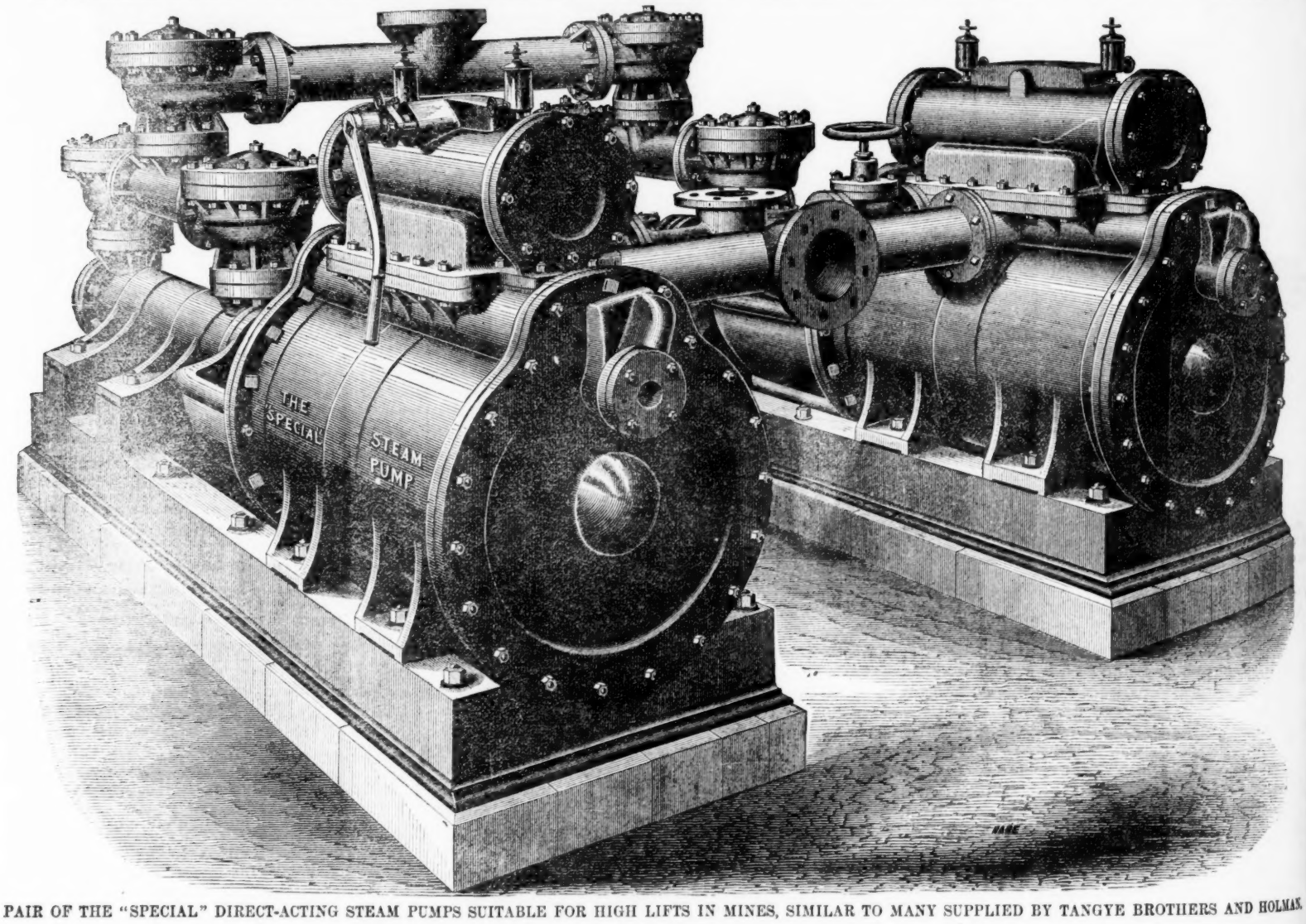
OVER **12,000** IN USE IN **ENGLAND** AND AMERICA.

SUCCESSFULLY ADOPTED IN A LARGE NUMBER OF MINES IN THIS COUNTRY AND ABROAD.



PAIR OF THE "SPECIAL" DIRECT-ACTING STEAM PUMPS SUITABLE FOR HIGH LIFTS IN MINES, SIMILAR TO MANY SUPPLIED BY TANGYE BROTHERS AND HOLMAN.

The following extracts from a letter, received by Tangye Brothers and Holman, from J. Bigland, Esq., dated Feb. 25, 1875, refers to a "Special" Direct-acting Steam Pumping Engine supplied four years ago to Messrs. Joseph Pease and Partners, for the Adelaide Colliery, Bishop Auckland. The engine is throwing about 8000 gallons per hour, 1040 feet high, in one direct ilft:—

"The underground pumping engine at Adelaide Colliery is working night and day. It does its work satisfactorily, and gives us very little tronble. Some of the cup leathers which form the plunger packing have worked three months. The working barrel is in beautiful condition. The average duration of the valve seats is about eight months; they work and keep tight as long as there is a bit of them left. I expect the valves (Holman's patent) and the buffers will last as long as the colliery."

Extract from a letter received by Tangye Brothers and Holman from W. H. Eagland, Esq., dated Feb. 27, 1875, in reference to a "Special" Direct-acting Steam Pumping Engine supplied two years ago to the West Yorkshire Iron and Coal Company near Leeds, to throw 16,000 gallons per hour, 465 feet high in one direct lift:—

"It is at work night and day. Our man goes down to the pump twice a day (Ten A.M. and Four P.M.), to supply the tallow cups. After this it is left every day till he comes next morning, when he goes down again at Ten A.M. as before. The only repairs the pump has had for 12 months are one bucket, which had worked since we got the pump, and one valve seat, but no valve, so it has cost very little. Its first lift is 70 yards perpendicular, then the water passes up pipes for half a mile, ascending another 70 yards, and then another perpendicular pipe of 15 yards —total, 55 yards vertical height.."

Extract from the Official Report of the Commission of the German Empire on the Vienna Exhibition of the 1873, treating on Pumping Engines:—

"Contrary to these older pumping engines exhibited, there is now nearly everywhere the opinion established that the ('SPECIAL') pumping engines placed underground, which are made on A. S. Cameron's principle by Messrs. Tangye, are preferable to all. They do much duty combined with great compactness. They dispense entirely with the troublesome rod arrangement, giving often rise to many pages, so that they will be applied shortly to a great extent, and are already in many localities. There is no doubt that this is in every respect practical system, will command a general adaptation."

200 SIZES AND COMBINATIONS OF THESE PUMPS ARE NOW MADE.

The following are a few of the Sizes for High Lifts in Mines:—

Diameter of Steam Cylinder .....In.	7	8	9	9	10	10	12	12	12	14	14	14	16	16	16	16	18	18	18	18	21	21	2
Ditto of Water Cylinder .....In.	3	3	3	4	3	4	3	4	5	4	5	6	4	5	6	7	5	6	7	8	5	6	7
Length of stroke .....In.	24	24	24	24	36	24	36	36	36	36	36	36	36	36	36	36	48	36	36	36	48	48	3
Gallons per hour approximate	1830	1830	1830	3250	1830	3250	1830	3250	5070	3250	5070	7330	3250	5070	7330	9750	5070	7330	9750	13,000	5070	7330	1
Height in feet to which water can be raised with 40 lbs. pressure per sq. in. of steam or compressed air at pump	325	425	540	300	665	375	960	540	345	735	470	330	960	615	426	312	775	540	400	300	1058	740	5

CONTINUED.

Diameter of Steam Cylinder .....In.	21	21	21	24	24	24	24	24	26	26	26	26	26	30	30	30	30	30	32	32	32	33	3
Ditto of Water Cylinder .....In.	8	9	10	6	7	8	9	10	7	8	9	10	12	8	9	10	12	14	8	9	10	12	
Length of stroke .....In.	36	36	36	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	4
Gallons per hour approximate	13,000	16,519	20,000	7330	9750	13,000	16,519	20,000	9750	13,000	16,519	20,000	30,000	13,000	16,519	20,000	30,000	40,000	13,000	16,519	20,000	30,000	40,0
Height in feet to which water can be raised with 40 lbs. pressure per sq. in. of steam or compressed air at pump	413	326	264	960	700	540	427	345	827	633	500	405	282	840	665	540	375	275	960	758	625	426	3

PRICES OF THE ABOVE ON APPLICATION.—FOR SIZES AND PRICES OF PUMPS FOR LOWER LIFTS SEE SEPARATE LIST.

HOLMAN'S PATENT CONDENSER will be found a great acquisition to all kinds of Steam Pumps, as not only is the exhaust steam completely condensed, and the annoyance from steam blowing off entirely got rid of, but a vacuum is obtained in the steam cylinder saving from 20 to 50 per cent. in fuel, and increasing to a considerable extent the economy and efficiency of the Pump.

NORTH OF ENGLAND HOUSE ... ... TANGYE BROTHERS AND RAKE, ST. NICHOLAS BUILDINGS, NEWCASTLE-ON-TYNE.
SOUTH WALES HOUSE... ... ... TANGYE BROTHERS AND STEEL, Tredegar Place, NEWPORT, Mon.; and Oxford Buildings, SWANSEA.

ATENT IMPROVED ORE WASHING & DRESSING MACHINES.

THE SANDYCROFT FOUNDRY & ENGINE WORKS CO. (LIMITED), NEAR CHESTER

LATE THE MOLD FOUNDRY CO. (ESTABLISHED 1833).

SOLE MAKERS IN GREAT BRITAIN.

HUNDREDS IN USE.

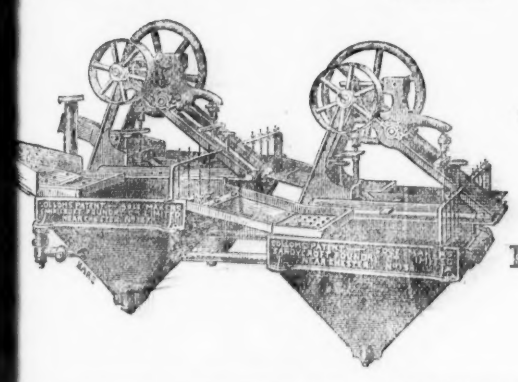
FULL PARTICULARS,
PHOTOGRAPHS, TESTIMONIALS, AND PRICES,
UPON APPLICATION.

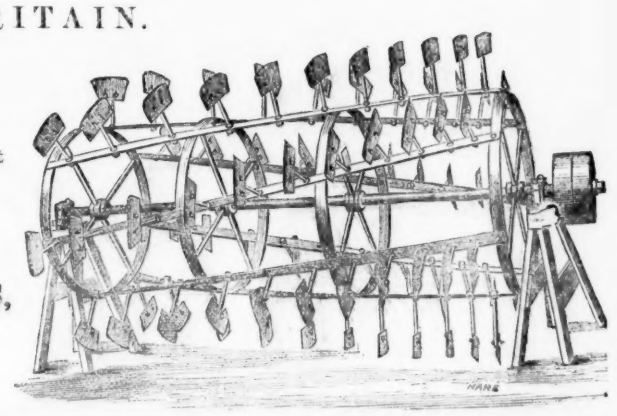
Will supply Designs, and all the necessary Plant for laying out Dressing Floors; also

MANUFACTURERS OF EVERY VARIETY OF

MINING MACHINERY

PUMPING & WINDING ENGINES,
PITWORK, CRUSHING MILLS,
ROLLS
OF PECULIARLY HARD AND TOUGH MIXTURE,
&c., &c.





LOM'S PATENT AUTOMATIC ORE WASHING MACHINE, working at the following and her Lead, Copper, Blende, and Tin Mines:—Great Laxey, Cape Copper, Pontgibaud, Linares, Alamillos, West Tolgus, Lisburne, Minera Halvans, Snailbeach, &c.; and also at Messrs. Vivian and Sons' Swansea.

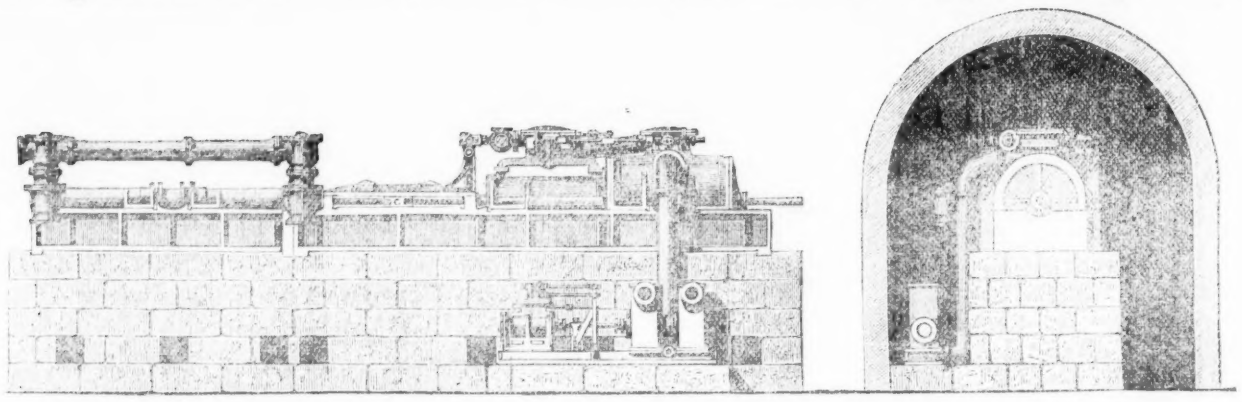
PATENT IMPELLER, OR KNIFE BUDDLE, in use at the following and many other Lead, Copper, Blende, and Tin Mines:—The Van, Roman Gravels, Tankerville, Ladywell, Lisburne, East Black Craig, Old Treburgett, Penhale & Barton, Bog, Linares, Fortuna, Alamillos, Minera, Halvans &c.

LONDON OFFICE: 6, QUEEN STREET PLACE, E.C.

HATHORN, DAVIS, CAMPBELL, AND DAVEY,

MAKERS OF

e Differential Pumping Engine, Hydraulic Pumping Engines, Cornish Engines, Differential lowing Engines, Compound Rotative Engines, the Separate Condenser, Hydraulic Machinery, Mining Plant of all kinds, and Machinery for Water Supply, Irrigation, &c.



THE COMPOUND DIFFERENTIAL ENGINE AND FORCE PUMPS,

With Separate Condenser, as applied Underground, forcing 700 gallons per minute 920 feet high.

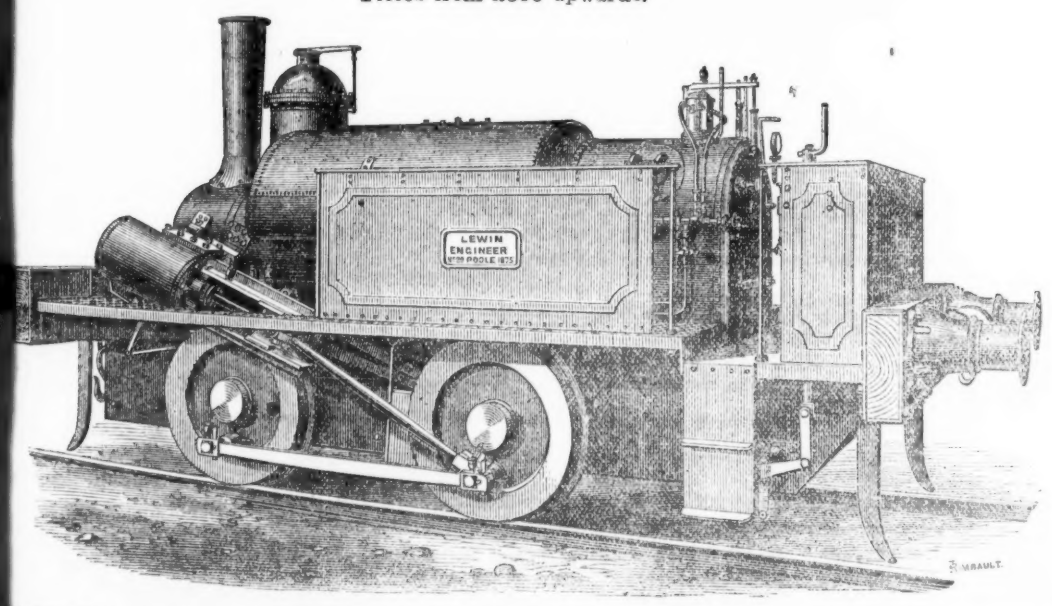
SUN FOUNDRY, LEEDS.

FURTHER PARTICULARS ON APPLICATION

LEWIN, POOLE, DORSET.

ciality in cheap colliery and contractors' Locomotives, and very small Locomotives for replacing Horses.

Prices from £300 upwards.



ORTABLE FIXED AND VERTICAL ENGINES.

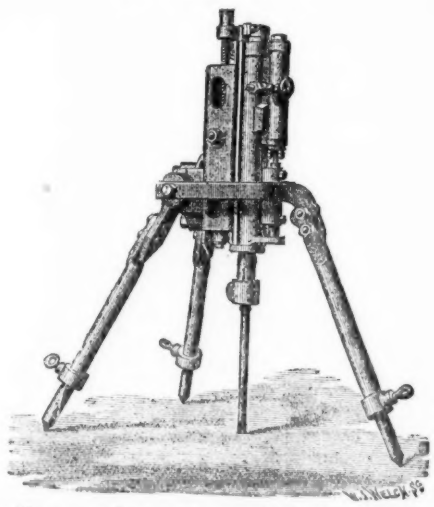
WINDING AND PUMPING GEAR.

The above represents LEWIN'S 10 by 18 DIRECT-ACTING LOCOMOTIVE, taken from a photo of one on a 4 ft. 8½ in. gauge.

THE "CHAMPION" ROCK BORER

For Tunnels, Mines, Quarries,

AND OTHER WORKS.



Intending purchasers can satisfy themselves that the advantages claimed for the "CHAMPION" over all other Rock Borers are not over-estimated.

For the amount of work it will do, it is the lightest, most compact, most durable, and cheapest in the market.

IMPROVED AIR COMPRESSORS,

And other MINING MACHINERY.

ULLATHORNE & CO.,
METROPOLITAN BUILDINGS,
63, QUEEN VICTORIA STREET, LONDON, E.C.

Ore Crushers, with H.R.M.'s New Patent Crushing Jaws,

EXTENSIVELY USED BY MINE OWNERS, &c.

OVER 1150 NOW IN USE.

H.R. MARSDEN, LEEDS,

PATENTEE, AND ONLY MAKER IN THE UNITED KINGDOM.

Intending Buyers are cautioned against purchasing any infringements of H. R. M.'s numerous Patents.

Great Improvements in Mining Machinery by the use of

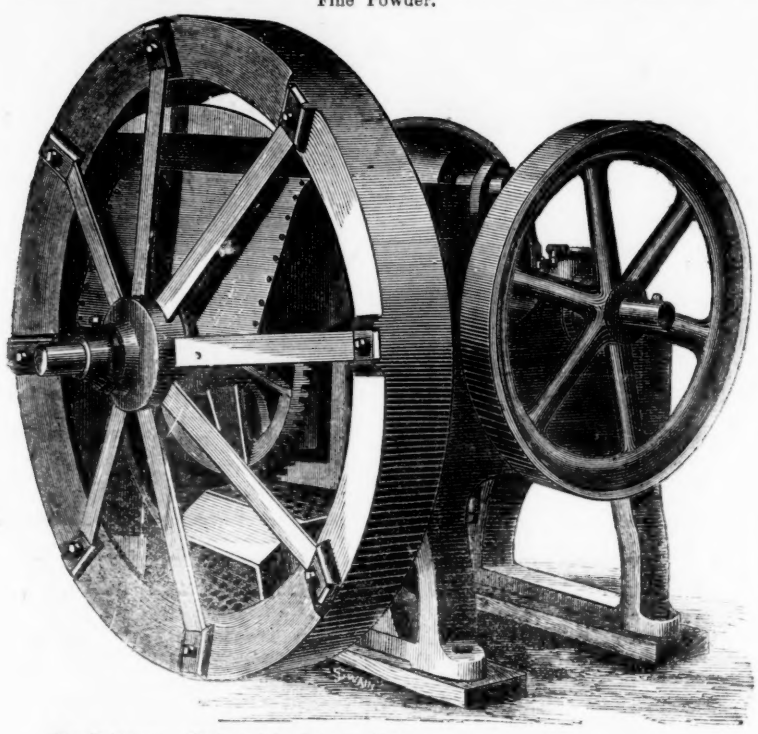
H. R. M.'s

NEW RAFF-WHEEL MACHINE,

WITH NEW PATENT CRUSHING JAWS,

BY WHICH ORES OF EVERY DESCRIPTION CAN BE REDUCED TO FINE POWDER.

New Raff Wheel Machine, fitted with H.R.M.'s Special Jaws for Crushing Stone, &c. to Fine Powder.



FIFTY GOLD AND SILVER FIRST CLASS PRIZE MEDALS, including the R. A. S.'s SILVER MEDAL, have been received in competition with other Stone Breakers.

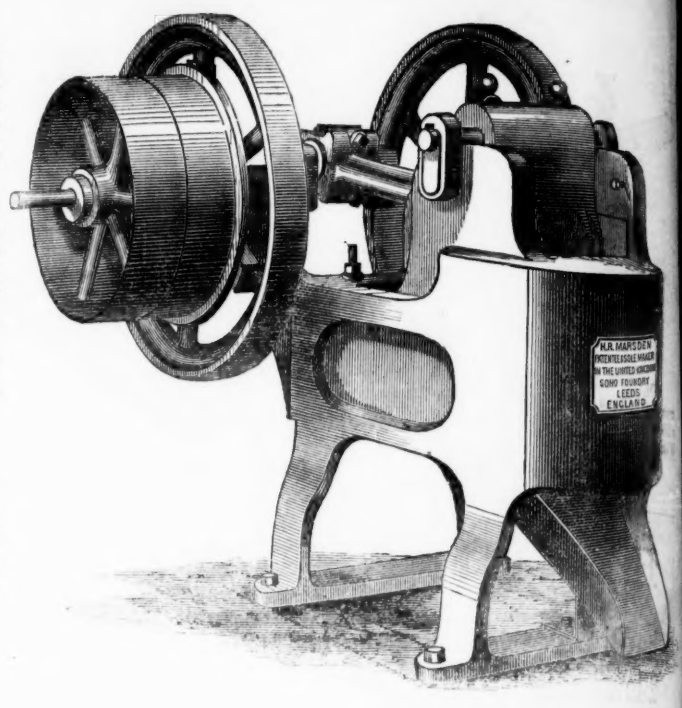
Machines fitted with H. R. M.'s renowned PATENT CUBING JAWS, by which stone is broken equal to hand at ONE-TENTH THE COST.

FEW WORKING PARTS.

SMALL WEAR and TEAR.

SIMPLICITY OF CONSTRUCTION, &c.

THE ONLY ORE CRUSHERS WHICH COMBINE AND EMBRACE THE TRUE PRINCIPLES OF ACTION AND CONSTRUCTION FOR THE PURPOSE DESIGNED.



For Catalogues, Tetimonials, &c., apply to—

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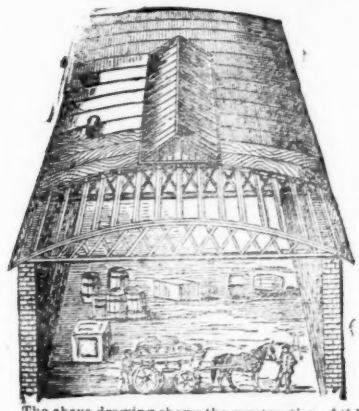
M'TEAR AND CO.'S CIRCULAR FELT ROOFING,



FOR GREAT ECONOMY AND CLEAR WIDE SPACE.

For particulars, estimates, and plans, address,—

M'TEAR & CO.,
ST. BENET CHAMBERS,
FENCHURCH STREET,
LONDON, E.C.;
4, PORTLAND STREET,
MANCHESTER;
OR
CORPORATION STREET,
BELFAST.

The above drawing shows the construction of this cheap and handsome roof, now much used for covering factories, stores, sheds farm buildings, &c., the principal of which are double bow and string girders of best pine timber, sheeted with ½ in. boards, supported on the girders by purlins running longitudinally, the whole being covered with patent waterproof roofing felt. These roofs so combine lightness with strength that they can be constructed up to 100 ft. span without centre supports, thus not only affording a clear wide space, but effecting a great saving both in the cost of roof and uprights.

They can be made with or without top-lights, ventilators, &c. Felt roofs of any description executed in accordance with plans. Prices for plain roofs from 30s. to 80s. per square, according to span, size, and situation.

Manufacturers of PATENT FELTED SHEATHING, for covering ships' bottoms under copper or zinc.

INODOROUS FELT for lining damp walls and under floor cloths.

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PATENT ASPHALTE ROOFING FELT, price 1d. per square foot.

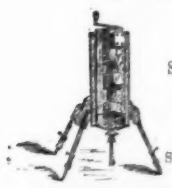
Wholesale buyers and exporters allowed liberal discounts.

PATENT ROOFING VARNISH, in boxes from 3 gallons to any quantity required 8d. per gallon.

DUNN'S ROCK DRILL,

AND

AIR COMPRESSORS,



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IS THE

CHEAPEST, SIMPLEST, STRONGEST, & MOST EFFECTIVE DRILL IN THE WORLD.

OFFICE,—193, GOSWELL ROAD
(W. W. DUNN AND CO.),
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HEPBURN'S
PUMP LEATHER
WATERPROOF

By a special method of preparation, this leather is made solid, perfectly close in texture, and impermeable to water; it has, therefore, all the qualifications essential for pump buckets, and is the most durable material of which they can be made. It may be had of all dealers in leather, and of—

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TANNERS AND CURRIERS, LEATHER MILLBAND AND HOSE PIPE MANUFACTURERS,
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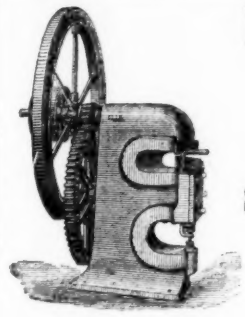
Prize Medals, 1851, 1855, 1862, for
MILL BANDS, HOSE, AND LEATHER FOR MACHINERY PURPOSES.

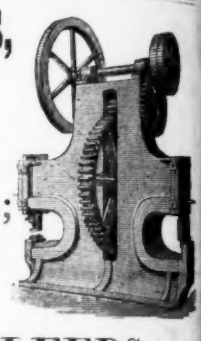


PUNCHING & SHEARING MACHINES,

Suitable for Collieries, Shipbuilders, Boiler Makers, Ironworks, &c.

Self-acting, Slide, and Screw-cutting Lathes;
Slotting Machines; Shaping Machines;
Drilling, Planing, and Screwing Machines;

And Miscellaneous Tools of every kind always in Stock.



J. GOODWORTH, KIRKSTALL ROAD, LEEDS.

Coal-Getting by Patent Hand-Worked Machinery,

WITHOUT THE USE OF GUNPOWDER.

No. 1 MACHINE - THE HAND COAL-CUTTER, for under-cutting.
2 ,, - THE ROCK & COAL PERFORATOR, for drilling.
3 ,, - THE SCREW WEDGE, for breaking down.

The use of these Machines, while doing away with the greatest source of danger, economises at least Fifty per cent. of the labour required in Getting Coal.

Particulars on application to—

MARTIN MACDERMOTT,
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N. HOLMAN AND SONS,

BRASS AND IRON FOUNDRIES AND ENGINE WORKS,
PENZANCE AND ST. JUST, CORNWALL,

Sole Makers of Stephens's Improved Patent Pulveriser,

FOR REDUCING TIN ROUGHS, LEAD SKIMPINGS, AND OTHER ORES.

The advantages possessed by these machines over others are—

1.—THE CHEAPNESS.
2.—THE SIMPLICITY OF CONSTRUCTION.
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4.—THE QUANTITY OF STUFF PULVERISED.
5.—THE PERFECT MANNER IN WHICH IT IS DONE.
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Estimates given for all classes of Mining Machinery, &c., for home and foreign supply.

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Manufacturers of WINDING, HAULING, and PUMPING ENGINES, Boilers and Fittings, Steam Piping, Donkey Pumps, Lift Pumps, Perforated Clay and Mortar Mills, Brick Presses, Pug Mills, Round and Flat Rope, Pit-head Pulleys, Wrought-iron Head Gear, ROOFS and GIRDERS, Kibbles, ONE, TWO, and THREE-DECK CAGES, COAL TIPPING and SCREENING APPARATUS, VENTILATING FANS, TUBBING, GIRDERS, PILLARS, POINT PLATES. Steam or other Cranes, Crabs and Windlasses, Machines for Cutting Stone, &c.

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